A Few Words About Safety

SERVICE INFORMATION

The service and repair information contained in this manual is intended for use by qualified, professional technicians. Attempting service or repairs without the proper training, tools, and equipment could cause injury to you and/or others. It could also damage this Honda product or create an unsafe condition.

This manual describes the proper methods and procedures for performing service, maintenance, and repairs. Some procedures require the use special tools. Any person who intends to use a replacement part, service procedure, or a tool that is not recommended by Honda must determine the risks to their personal safety and the safe operation of this product.

If you need to replace a part, use Honda Genuine parts with the correct part number or an equivalent part. We strongly recommend that you do not use replacement parts of inferior quality.

For Your Customer's Safety

Proper service and maintenance are essential to the customer's safety and the reliability of this product. Any error or oversight while servicing this product can result in faulty operation, damage to the product, or injury to others.

⚠WARNING

Improper service or repairs can create an unsafe condition that can cause your customer or others to be seriously hurt or killed.

Follow the procedures and precautions in this manual and other service materials carefully.

For Your Safety

Because this manual is intended for the professional service technician, we do not provide warnings about many basic shop safety practices (e.g., Hot parts-wear gloves). If you have not received shop safety training or do not feel confident about your knowledge of safe servicing practices, we recommend that you do not attempt to perform the procedures described in this manual.

Some of the most important general service safety precautions are given below. However, we cannot warn you of every conceivable hazard that can arise in performing service and repair procedures. Only you can decide whether or not you should perform a given task.

⚠WARNING

Failure to properly follow instructions and precautions can cause you to be seriously hurt or killed.

Follow the procedures and precautions in this manual carefully.

Important Safety Precautions

Make sure you have a clear understanding of all basic shop safety practices and that you are wearing appropriate clothing and using safety equipment. When performing any service task, be especially careful of the following:

- Read all of the instructions before you begin, and make sure you have the tools, the replacement or repair parts, and the skills required to perform the tasks safely and completely.
- Protect your eyes by using proper safety glasses, goggles, or face shields anytime you hammer, drill, grind, or work around pressurized air, pressurized liquids, springs, or other stored-energy components. If there is any doubt, put on eye protection.
- Use other protective wear when necessary, for example gloves or safety shoes. Handling hot or sharp parts can cause severe burns or cuts. Before you grab something that looks like it can hurt you, stop and put on gloves.
- Protect yourself and others whenever you have equipment hoisted in the air. Anytime you lift this product with a hoist, make sure that the hoist hook is securely attached to the product.

Make sure the engine is off before you begin any servicing procedures, unless the instruction tells you to do otherwise. This will help eliminate several potential hazards:

- Carbon monoxide poisoning from engine exhaust. Be sure there is adequate ventilation whenever you run the engine.
- Burns from hot parts. Let the engine and exhaust system cool before working in those areas.
- Injury from moving parts. If the instruction tells you to run the engine, be sure your hands, fingers and clothing are out of the way.

Gasoline vapors and hydrogen gasses from batteries are explosive. To reduce the possibility of a fire or explosion, be careful when working around gasoline or batteries.

- Use only a nonflammable solvent, not gasoline, to clean parts.
- Never store gasoline in an open container.
- Keep all cigarettes, sparks, and flames away from the battery and all fuel-related parts.

CONTENTS

INTRODUCTION

This manual covers the service and repair procedures for Honda WX10T water pump.

All information contained in this manual is based on the latest product information available at the time of printing. We reserve the right to make changes at anytime without notice.

As you read this manual, you will find information that is preceded by a NOTICE symbol. The purpose of this message is to help prevent damage to this Honda product, other property, or the environment.

SAFETY MESSAGES

Your safety, and the safety of others, are very important. To help you make informed decisions, we have provided safety messages and other safety information throughout this manual. Of course, it is not practical or possible to warn you about all the hazards associated with servicing these products. You must use your own good judgment.

You will find important safety information in a variety of forms, including:

- Safety Labels – on the product.
- Safety Messages – preceded by a safety alert symbol ⚠ and one of three signal words, DANGER, WARNING, or CAUTION. These signal words mean:

⚠DANGER You WILL be KILLED or SERIOUSLY HURT if you don't follow instructions.

⚠WARNING You CAN be KILLED or SERIOUSLY HURT if you don't follow instructions.

⚠CAUTION You CAN be HURT if you don't follow instructions.

- Instructions – how to service these products correctly and safely.

SERVICE PUBLICATION OFFICE

Date of Issue: September 2014

SERVICE RULES

- Use Honda Genuine or Honda-recommended parts and lubricants or their equivalents. Parts that do not meet Honda's design specifications may damage the unit.
- Use the special tools designed for the product.
- Install new gaskets, O-rings, etc. when reassembling.
- When torquing bolts or nuts, begin with larger-diameter or inner bolts first and tighten to the specified torque diagonally, unless a particular sequence is specified.
- Clean parts in cleaning solvent upon disassembly. Lubricate any sliding surfaces before assembly.
- After assembly, check all parts for proper installation and operation.
- Many screws used in this machine are self-tapping. Be aware that cross-threading or overtightening these screws will strip the threads and ruin the hole.

Use only metric tools when servicing this unit. Metric bolts, nuts and screws are not interchangeable with non-metric fasteners. The use of incorrect tools and fasteners will damage the unit.

SYMBOLS

The symbols used throughout this manual show specific service procedures. If supplementary information is required pertaining to these symbols, it will be explained specifically in the text without the use of the symbols.

	Replace the part(s) with new one(s) before assembly.
	Use the recommend engine oil, unless otherwise specified.
	Use molybdenum oil solution (mixture of the engine oil and molybdenum grease in a ratio of 1:1).
	Use multi-purpose grease (lithium based multi-purpose grease NLGI #2 or equivalent).
	Use marine grease (water resistant urea based grease).
	Apply a locking agent. Use a medium strength locking agent unless otherwise specified.
	Apply sealant.
	Use automatic transmission fluid.
○ x ○ (○)	Indicates the diameter, length, and quantity of metric bolts used.
page 1-1	Indicates the reference page.

ABBREVIATIONS

Throughout this manual, the following abbreviations are used to identify the respective parts or systems.

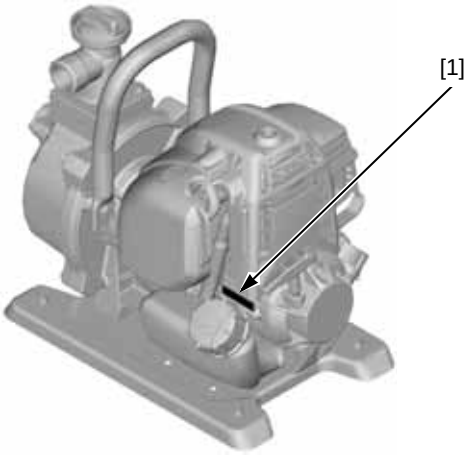
Abbreviated term	Full term
ACG	Alternator
API	American Petroleum Institute
Approx.	Approximately
Assy.	Assembly
ATDC	After Top Dead Center
ATF	Automatic Transmission Fluid
ATT	Attachment
AVR	Auto Voltage Regulator
BAT	Battery
BDC	Bottom Dead Center
BTDC	Before Top Dead Center
BARO	Barometric Pressure
CKP	Crankshaft Position
Comp.	Complete
CMP	Camshaft Position
CYL	Cylinder
DLC	Data Link Connector
D-AVR	Digital Auto Voltage Regulator
EBT	Engine Block Temperature
ECT	Engine Coolant Temperature
ECM	Engine Control Module
EMT	Exhaust Manifold Temperature
EOP	Engine Oil Pressure
EX	Exhaust
F	Front or Forward
GND	Ground
HO2S	Heated Oxygen sensor
IAB	Intake Air Bypass
IAC	Idle Air Control
IAT	Intake Air Temperature
I.D.	Inside diameter
IG or IGN	Ignition
IN	Intake
INJ	Injection
L.	Left
MAP	Manifold Absolute Pressure
MIL	Malfunction Indicator Lamp
O.D.	Outside Diameter
OP	Optional Part
PGM-FI	Programmed-Fuel Injection
P/N	Part Number
Qty	Quantity
R.	Right
SAE	Society of Automotive Engineers
SCS	Service Check Signal
STD	Standard
SW	Switch
TDC	Top Dead Center

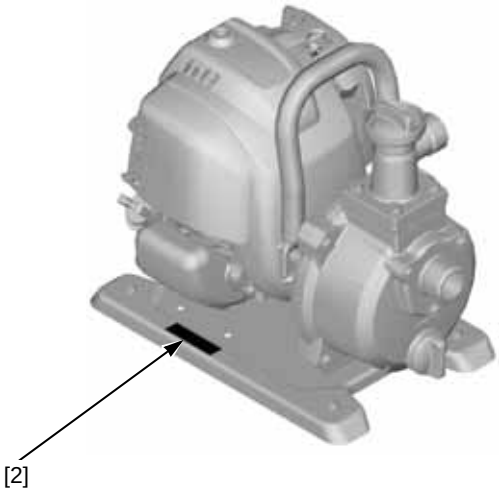
BI	Black	G	Green	Br	Brown	Lg	Light green
Y	Yellow	R	Red	O	Orange	P	Pink
BU	Blue	W	White	Lb	Light blue	Gr	Gray

1. SPECIFICATIONS

SERIAL NUMBER LOCATION

The engine serial number [1] is located on the cylinder barrel.
The frame serial number [2] is located on the frame.
Refer to these numbers when ordering parts and when making technical inquiries.





SPECIFICATIONS

DIMENSIONS AND WEIGHTS

Model	WX10T
Description code	WAGT
Type	A/C
Overall length	340 mm (13.4 in)
Overall width	220 mm (8.7 in)
Overall height	295 mm (11.6 in)
Dry weight	6.1 kg (13.4 lbs)
Operating weight	6.5 kg (14.3 lbs)

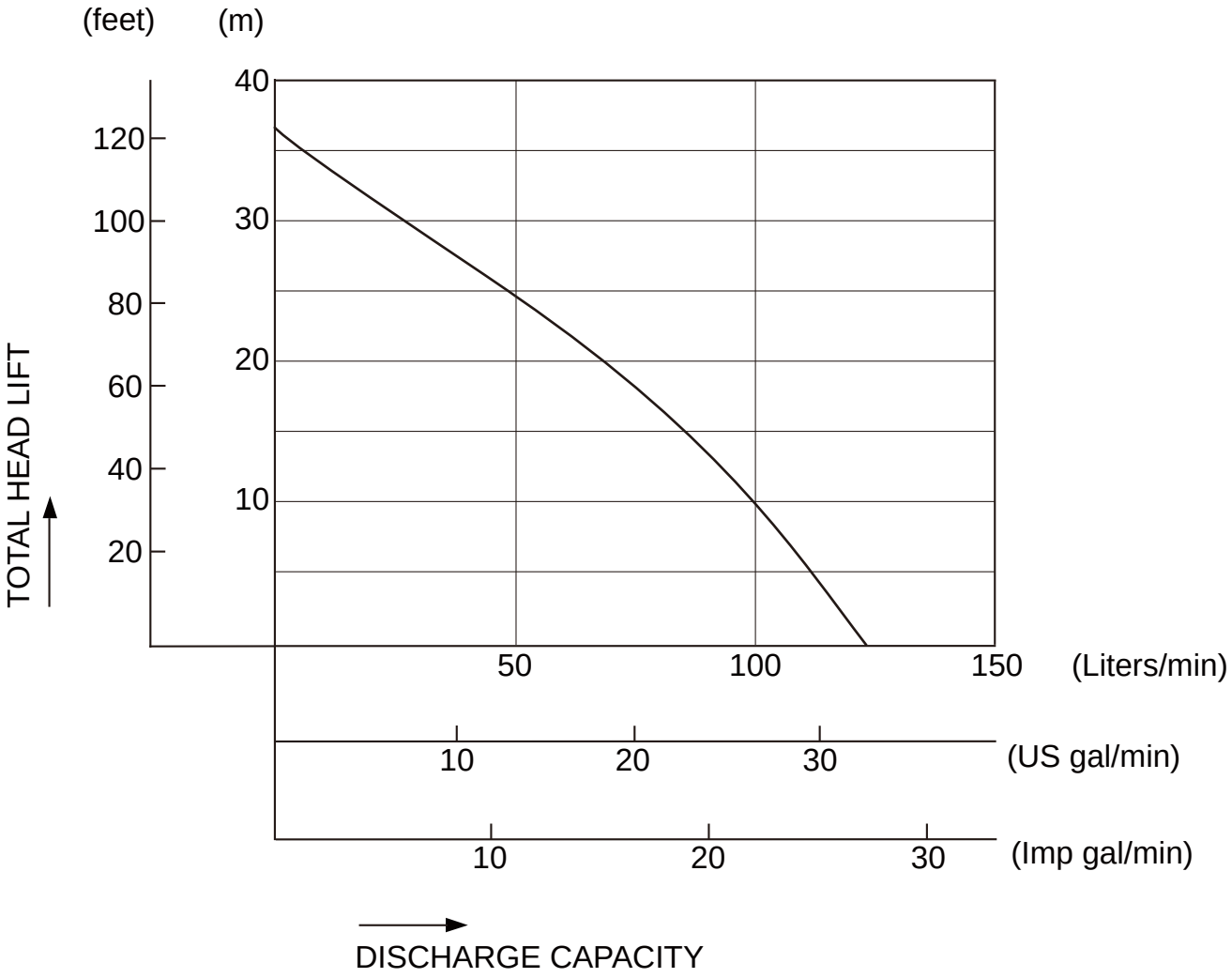
ENGINE

Engine model	GX25T	
Description code	GCALT	
Type	4 stroke, OHC, single cylinder	
Displacement	25 cm^3 (1.5 cu–in)	
Bore x stroke	35.0×26.0 mm (1.38 x 1.02 in)	
Compression ratio	8.0±0.5	
Ignition system	Transistor magneto ignition	
Ignition timing	B.T.D.C. 30°±2°	
Spark plug	CMR5H (NGK)	
Lubrication system	Pumping spray system	
Oil capacity	0.08 liter (0.08 US qt, 0.07 Imp qt)	
Recommended oil	A type	SAE 10W – 30 API service classification SJ or later
	C type	SAE 10W – 30 API service classification SE or higher
Cooling system	Forced air	
Starting system	Recoil starter	
Stopping system	Ignition primary circuit ground	
Carburetor	Diaphragm type	
Air cleaner	Semi-dry type	
Breather system	Reed valve type	
Fuel tank capacity	0.53 liter (0.021 US gal, 0.018 Imp gal)	
Fuel used	Unleaded gasoline with a pump octane rating 86 or higher	

WATER PUMP

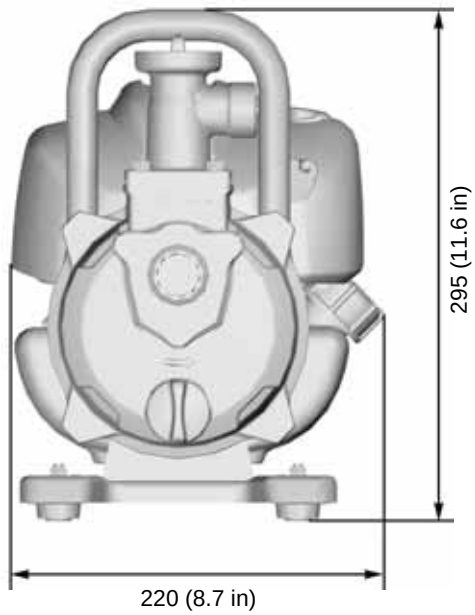
Model	WX10T
Type	Self priming centrifugal pump
Drive system	Direct connection engine
Suction port diameter	25 mm (1.0 in)
Discharge port diameter	25 mm (1.0 in)
Maximum total head	37 m (121 ft)
Maximum suction head	8 m (26.2 ft)
Maximum discharge capacity	120 liters (31.7 US gal, 26.4 Imp gal) /min
Maximum discharge pressure	359 kPa (52 psi)
Maximum self-feed time	80 sec at 5 m (16.4 ft)
Approx. operating hours (at max discharge)	0.9 Hr.

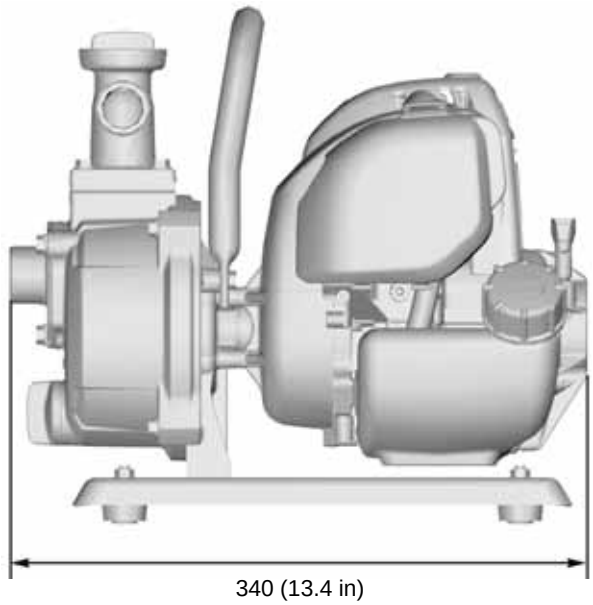
PERFORMANCE CURVE



DIMENSIONAL DRAWINGS

Unit: mm (in)





MEMO

2. SERVICE INFORMATION

MAINTENANCE STANDARDS

ENGINE

Unit: mm (in)

Part	Item		Standard	Service limit
Engine	Idle speed		4,100 ± 200 min^{-1} (rpm)	–
	Cylinder compression		0.90 MPa (9.2 kgf/cm^2, 131 psi)/2.000 min^{-1} (rpm)	–
Cylinder	Sleeve I.D.		35.000 - 35.015 (1.3780 – 1.3785)	35.100 (1.3819)
Piston	Skirt O.D.		34.970 - 34.990 (1.3768 – 1.3776)	34.900 (1.3740)
	Piston-to-cylinder clearance		0.010 - 0.045 (0.0004 – 0.0018)	0.120 (0.0047)
	Piston pin bore I.D.		8.010 - 8.026 (0.3154 – 0.3160)	8.060 (0.3173)
Piston pin	Pin O.D.		7.994 - 8.000 (0.3147 – 0.3150)	7.950 (0.3130)
	Piston pin-to-piston pin bore clearance		0.010 - 0.032 (0.0004 – 0.0013)	0.070 (0.0028)
Piston rings	Ring side clearance	Top/second	0.015 - 0.056 (0.0006 – 0.0022)	0.120 (0.0047)
	Ring end gap	Top/second	0.10 - 0.25 (0.004 – 0.010)	0.60 (0.024)
	Ring width	Top/second	0.970 - 0.990 (0.0382 – 0.0390)	0.920 (0.0362)
Connecting rod	Small end I.D.		7.978 - 7.989 (0.3141 – 0.3145)	–
Cylinder barrel	Barrel I.D. (Cam pulley bearing)		4.000 - 4.018 (0.1575 – 0.1582)	4.050 (0.1594)
Valves	Valve clearance	IN	0.08 ± 0.02 (0.003 ± 0.001)	–
		EX	0.11 ± 0.02 (0.004 ± 0.001)	–
	Valve stem O.D.	IN	3.470 - 3.485 (0.1366 – 0.1372)	3.400 (0.1339)
		EX	3.435 - 3.450 (0.1352 – 0.1358)	3.380 (0.1331)
	Valve guide I.D.	IN/EX	3.500 - 3.518 (0.1378 – 0.1385)	3.560 (0.1402)
	Guide-to-stem clearance	IN	0.015 - 0.048 (0.0006 – 0.0019)	0.098 (0.0039)
		EX	0.050 - 0.083 (0.0020 – 0.0033)	0.120 (0.0047)
	Valve spring free length		20.66 (0.8621)	20.00 (0.787)
Campulley	Cam height		21.897 - 22.297(0.8621 – 0.8778)	21.797 (0.8581)
	Campulley I.D.		4.020 - 4.050 (0.1583 – 0.1594)	4.100 (0.1614)
	Campulleyshaft O.D.		3.990 - 4.000 (0.1571 – 0.1575)	3.950 (0.1555)
Carburetor	Main jet		# 34	–
Spark plug	Gap		0.60 - 0.70 (0.024 – 0.028)	–
Ignition coil	Air gap		0.2 - 0.4 (0.01 – 0.02)	–
	Primary resistance		0.585 - 0.715 Ω	–
	Secondary resistance		4.77 - 5.83 kΩ	–
Engine P.T.O. shaft	Shaft O.D.		11.966 - 11.984 (0.4711 – 0.4718)	11.800 (0.4646)

PUMP

Unit: mm (in)

Part	Item	Standard	Service limit
Pump	Impeller Clearance	0.70 - 1.00 (0.028 – 0.039)	–

TORQUE VALUES

ENGINE

Item	Thread Dia. (mm)	Torque values			Remark
		N·m	kgf·m	lbf·ft	
Spark plug	M10×1.0	11.8	1.2	9	
Fan cover bolt	M5×0.8	6.4	0.65	4.7	
Lower crankcase bolt	M5×0.8 (CT)	6.4	0.65	4.7	CT (Cutting Thread) indicates a self-tapping bolt.
Recoil starter pulley	M6×1.0	6.4	0.65	4.7	
Flywheel nut	M7×1.0	14.7	1.5	11	
Ignition coil bolt	M4×0.7	3.9	0.40	2.9	
Oil outlet valve screw	M4×0.7	3.0	0.31	2.2	
Adjusting screw lock nut	M5×0.5	4.9	0.50	3.6	
Top cover bolt	M5×0.8	3.0	0.31	2.2	
Muffler stud bolt	M5×0.8	4.4	0.45	3.2	

PUMP

Item	Thread Dia. (mm)	Torque values			Remark
		N·m	kgf·m	lbf·ft	
Impeller	M8×1.25	6.9	0.70	5.1	
Casing cover bolt	M5×0.8	5.0	0.51	3.7	

STANDARD TORQUE VALUES

ENGINE

Item	Thread Dia. (mm)	Torque values		
		N·m	kgf·m	lbf·ft
Screw	3 mm	1.0	0.10	0.7
	4 mm	2.1	0.21	1.5
Bolt and nut	4 mm	3.4	0.35	2.5
	5 mm	5.4	0.55	4.0
	6 mm	9.8	1.00	7.2
CT (Cutting threads) flange bolt (Retightening)	5 mm	5.9	0.60	4.4

FRAME

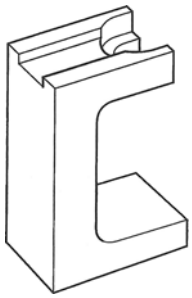
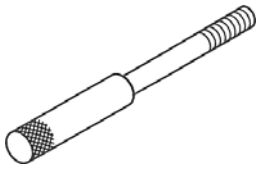
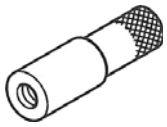
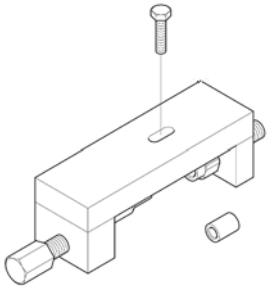
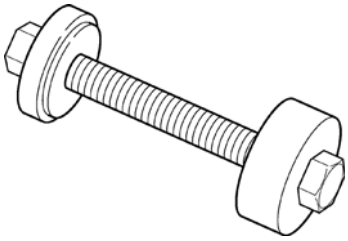
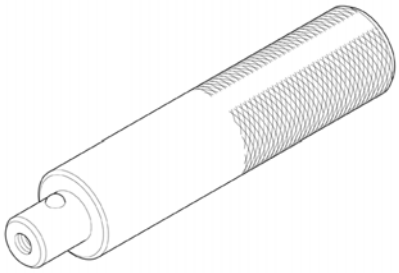
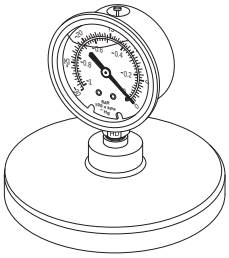
Item	Thread Dia. (mm)	Torque values		
		N·m	kgf·m	lbf·ft
Screw	4 mm	2.1	0.21	1.5
	5 mm	4.3	0.44	3.2
	6 mm	9.0	0.92	6.6
Bolt and nut	5 mm	5.3	0.54	3.9
	6 mm	10	1.0	7
	8 mm	22	2.2	16
	10 mm	34	3.5	25
	12 mm	54	5.5	40
Flange bolt and nut	5 mm	5.3	0.54	3.9
	6 mm	12	1.2	9
	8 mm	27	2.7	20
	10 mm	40	4.1	30
SH (Small head) flange bolt	6 mm	9.0	0.92	6.6
CT (Cutting threads) flange bolt (Retightening)	5 mm	5.4	0.55	4.0
	6 mm	12	1.2	9

LUBRICATION & SEAL POINT

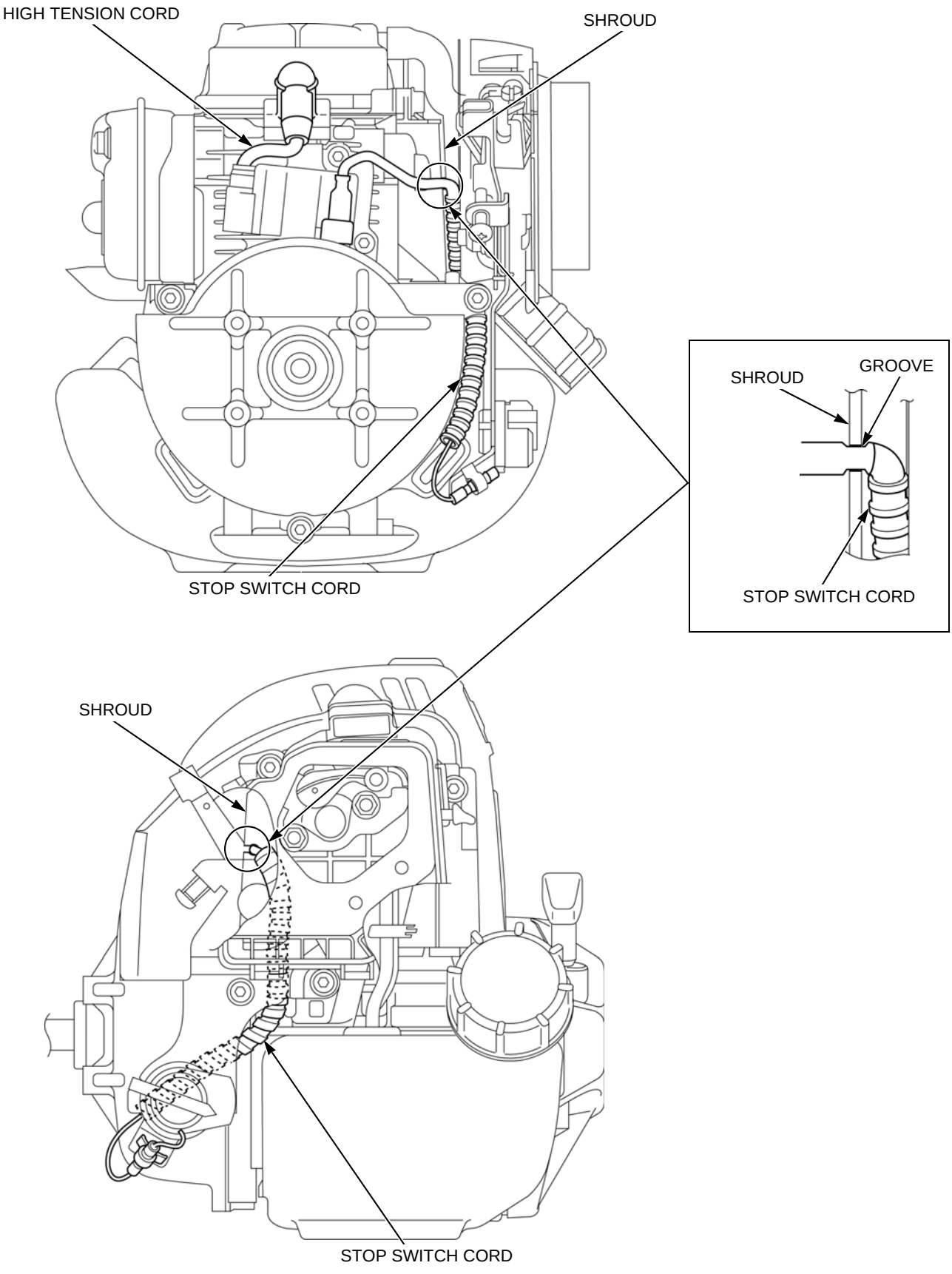
ENGINE

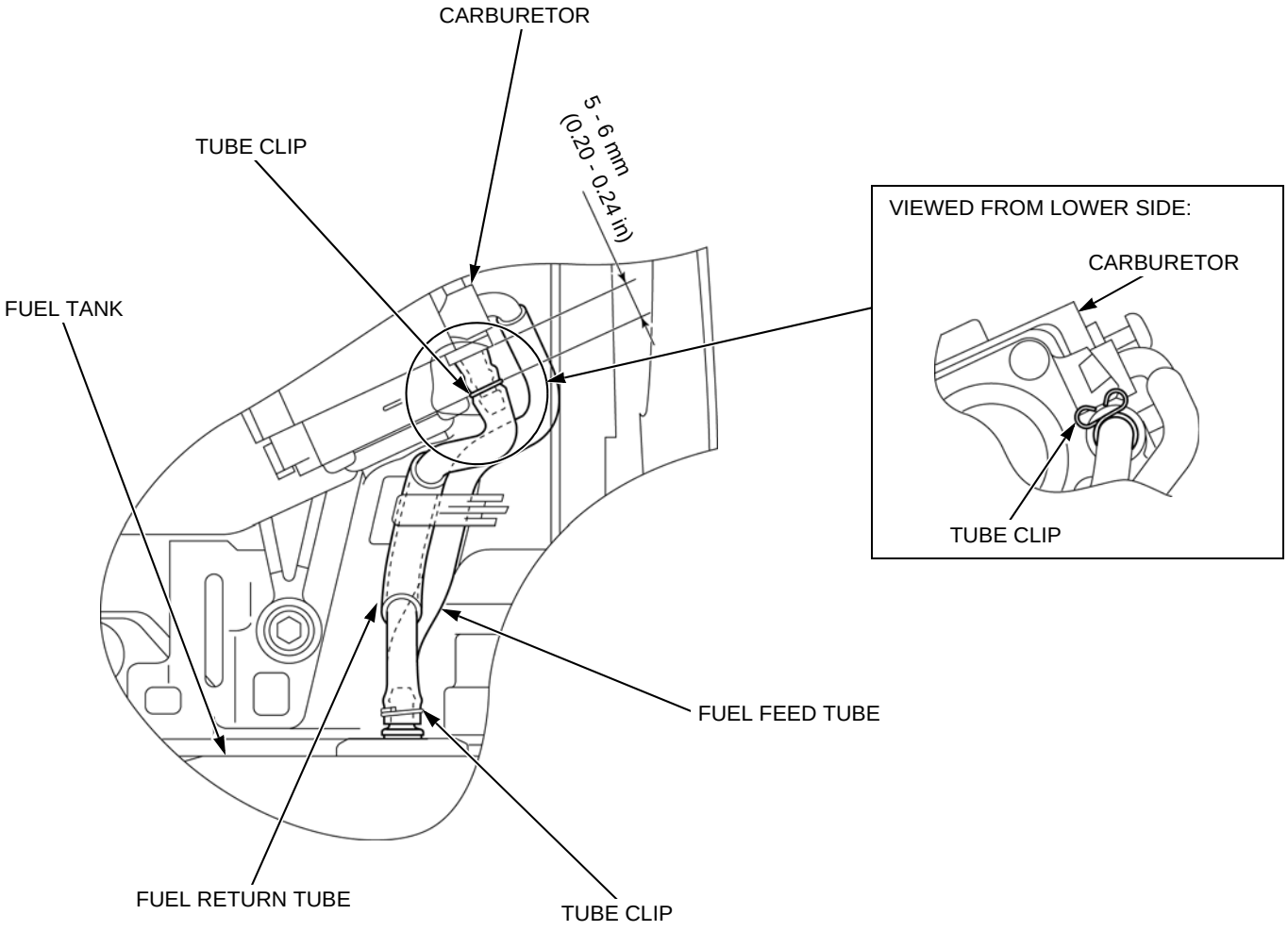
Material	Location	Remarks
Molybdenum disulfide oil (mixture of the engine oil and molybdenum grease in a ratio of 9:1)	Piston outer surface	
	Piston rings	
	Piston pin outer surface	
	Cylinder barrel inner surface	
Engine oil	Each ball bearing rolling surface	
	Cam pulley cam profile and journal	
	Cam pulley decompressor pin whole surface	
	Cam pulley gear teeth	
	Valve lifter shaft whole surface and journal	
	Valve lifter slipper	
	Valve stem sliding surface	
	Valve spring whole surface	
	O–ring	
	Flywheel nut threads and seating surface	
Multi-purpose grease	Oil seal lip	
	Recoil starter case (Recoil starter reel sliding area)	
Liquid sealant (ThreeBond® #1216E, Hondabond HT or equivalent)	Cylinder barrel and the lower crankcase mating surfaces	
Locking agent (ThreeBond® #1322N, Hondalock 2 or equivalent)	Shroud mounting socket bolt	

TOOLS

Piston base 07VPF-ZM3010B 	Push rod 07VPF-ZM3020A 	Guide 07VPF-ZM3030A 
Rocker arm replacement tool 070PF-Z0HA100 	Mechanical seal installer 07965-415000A 	Attachment, 24 x 26 mm 07746-0010700 
Pilot, 12 mm 07746-0040200 	Driver 07749-0010000 	Attachment, 28 x 30 mm 07946-1870100 
Vacuum gauge 07APJ-YB3A100 		

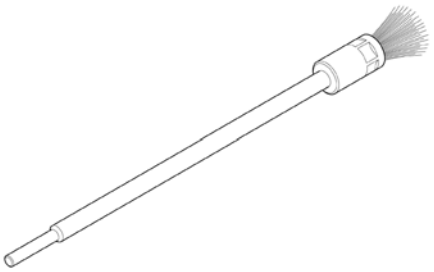
HARNESS AND TUBE ROUTING




CARBURETOR
TUBE CLIP
5 - 6 mm
(0.20 - 0.24 in)
FUEL TANK
VIEWED FROM LOWER SIDE:
CARBURETOR
TUBE CLIP
FUEL FEED TUBE
FUEL RETURN TUBE
TUBE CLIP

MEMO

TOOL

Cleaning brush (commercially available) 	Vacuum tester 07APJ-YB3A100 

MAINTENANCE SCHEDULE

ITEM	Perform at every indicated month or operating hour interval, whichever comes first.	REGULAR SERVICE PERIOD (2)						Refer to page
		Each use	First month or 10 hrs.	Every 3 months or 25 hrs.	Every 6 months or 50 hrs.	Every year or 100 hrs.	Every two years or 300 hrs.	
Engine oil	Check level	○						3-4
	Change		○		○			3-4
Air cleaner	Check	○						3-5
	Clean			○ (1)				3-5
Spark plug	Check–adjust					○		3-6
	Replace						○	3-6
Spark arrester (applicable types)	Clean					○		3-7
Engine cooling fins	Clean				○			-
Nuts, bolts, fasteners	Check (Retighten if necessary)	○						-
Idle speed	Check–adjust					○		3-7
Valve clearance	Check–adjust					○		3-8
Combustion chamber	Clean	After every 300 hours(3)						3-9
Fuel filter	Clean					○		3-9
Fuel tank	Clean					○		3-9
Fuel tube	Check	Every 2 years (Replace if necessary)						3-9
Oil tube	Check	Every 2 years (Replace if necessary)						12-3
Impeller	Check					○		3-10
Impeller clearance	Check					○		3-11
Pump inlet valve	Check					○		3-13

(1) Service more frequently when used in dusty areas.

(2) For commercial use, log hours of operation to determine proper maintenance intervals.

ENGINE OIL LEVEL CHECK/CHANGE

SERVICE BULLETIN #9

CHECK

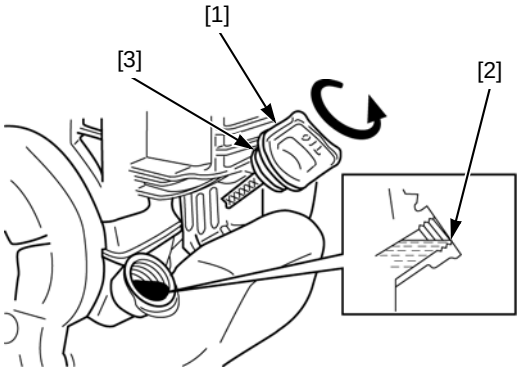
Place the water pump on a level surface.

Remove the oil filler cap [1] and verify the oil level is at the top of the oil filler neck [2].

If the oil level is low, fill with recommended oil to the top of the oil filler neck (page 3-4).

Check that the oil filler packing [3] is in good condition; replace it if necessary.

Install and tighten the oil filler cap securely.



CHANGE

Drain the oil in the engine while the engine is warm. Warm oil drains quickly and completely.

Check that the fuel tank cap [1] is tightened securely.

Remove the oil filler cap [2].

Tilt the engine toward the oil filler cap side and drain the used oil in a suitable container. Dispose of used engine oil in a manner that is compatible with the environment. We suggest you take used oil in a sealed container to your local recycling center or service station for reclamation. Do not throw it in the trash, pour it into the ground, or down a drain.

⚠CAUTION

Used engine oil contains substances that have been identified as carcinogenic.

If repeatedly left in contact with the skin for prolonged periods, it may cause skin cancer.

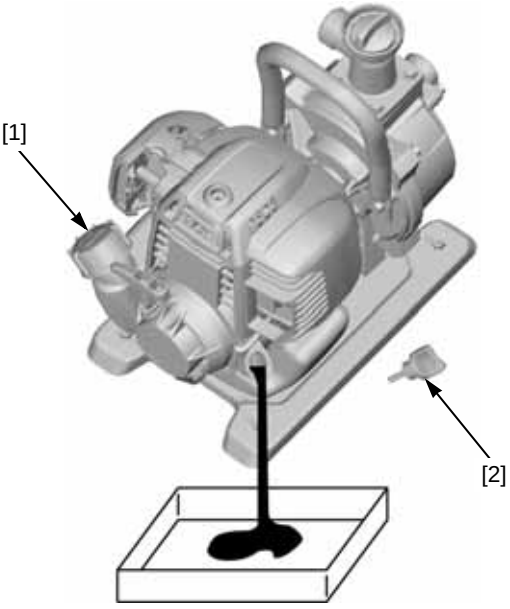
Wash your hands thoroughly with soap and water as soon as possible after contact with used engine oil.

Fill with recommended oil to the upper level.

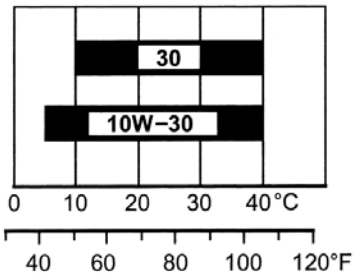
ENGINE OIL CAPACITY:
0.08 Liters (0.08 US qt, 0.07 Imp qt)

RECOMMENDED OIL:
A type:
SAE 10W-30
API service classification: SJ or later
C type:
SAE 10W-30
API service classification: SE or higher

Tighten the oil filler cap.



SAE VISCOSITY GRADES



AMBIENT TEMPERATURE

AIR CLEANER CHECK/CLEANING

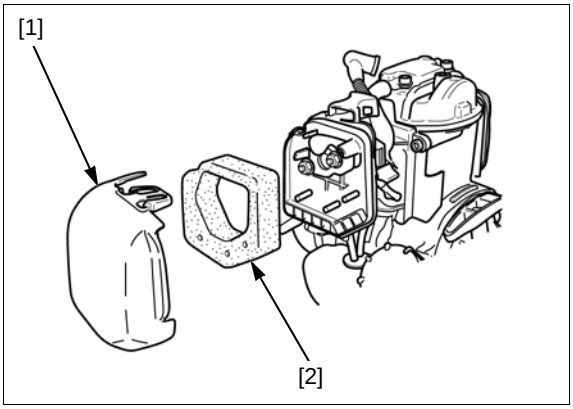
CHECK

A dirty air cleaner will restrict air flow to the carburetor, reducing engine performance. If the engine is operated in dusty areas, clean the air cleaner more often than specified in the MAINTENANCE SCHEDULE.

Remove the air cleaner cover [1] and air cleaner element [2].

Inspect the air cleaner element for holes or tears, and replace if damaged.

Installation is in the reverse order of removal.



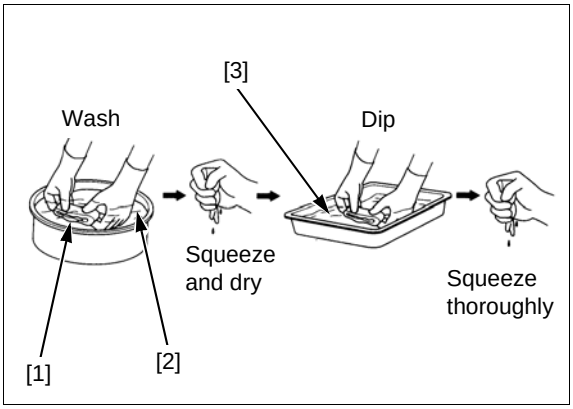
CLEANING

Clean the element [1] in warm soapy water [2], rinse and allow to dry thoroughly, or clean with a high flash point solvent and allow to dry.

Dip the element in clean engine oil [3] and squeeze out all the excess oil.

NOTICE

- *Excess oil will restrict air flow through the foam element and may cause the engine to smoke at startup.*
- *Do not twist to squeeze oil from the air cleaner element. Twisting the element can damage it.*



SPARK PLUG CHECK/ADJUSTMENT

Remove the spark plug (page 3-6).

Clean the spark plug [1] electrodes with a wire brush [2] or special plug cleaner.

Check the following and replace if necessary.

– Insulator [3] and sealing washer [4] for damage
– Center electrode [5] and side electrode [6] for wear
– Burning condition, coloration

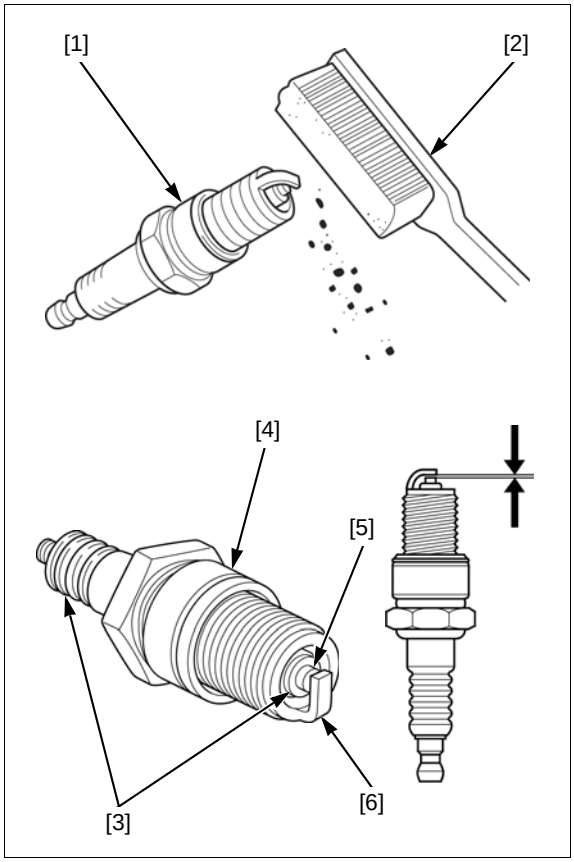
RECOMMENDED SPARK PLUG:
CMR5H (NGK)

Measure the plug gap with a wire-type feeler gauge.

PLUG GAP: 0.60 – 0.70 mm (0.024 – 0.028 in)

If the measurement is out of the specification, adjust by bending the side electrode.

Install the spark plug (page 3-6).



SPARK PLUG REPLACEMENT

REMOVAL

⚠CAUTION

The muffler becomes very hot during operation and remains hot for a while after stopping the engine.

Touching a hot muffler can severely burn you.

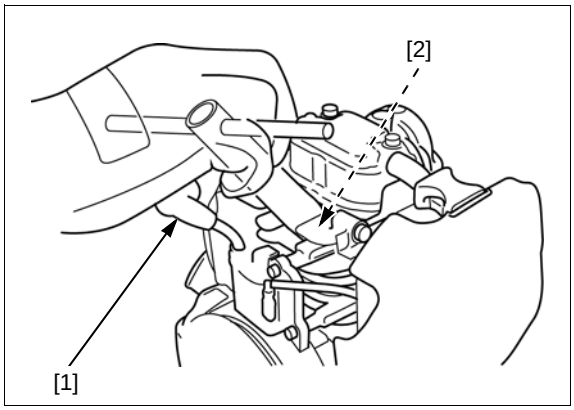
Allow the muffler to cool before proceeding.

Remove the top cover (page 5-2).

Disconnect the spark plug cap [1] and remove the spark plug [2].

NOTE:

- Clean around the spark plug base with compressed air before removing the spark plug and be sure that no debris is allowed to enter into the combustion chamber.



INSTALLATION

Install and hand tighten the spark plug to the cylinder barrel.

RECOMMENDED SPARK PLUG:
CMR5H (NGK)

Tighten the spark plug to the specified torque.

TORQUE: 11.8 N·m (1.2 kgf·m, 9 lbf·ft)

Connect the spark plug cap.

SPARK ARRESTER CLEANING (Applicable types)

⚠CAUTION

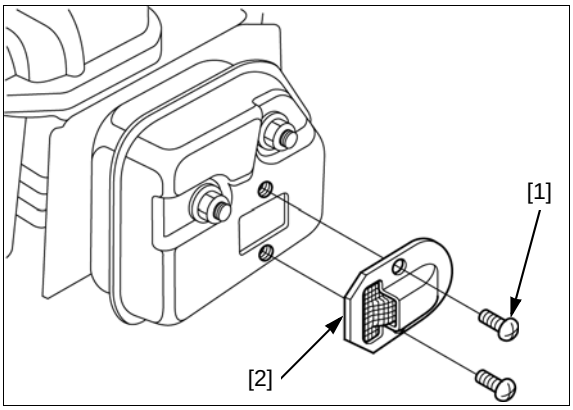
The muffler becomes very hot during operation and remains hot for a while after stopping the engine.

Touching a hot muffler can severely burn you.

Allow the muffler to cool before proceeding.

Remove the top cover (page 5-2).

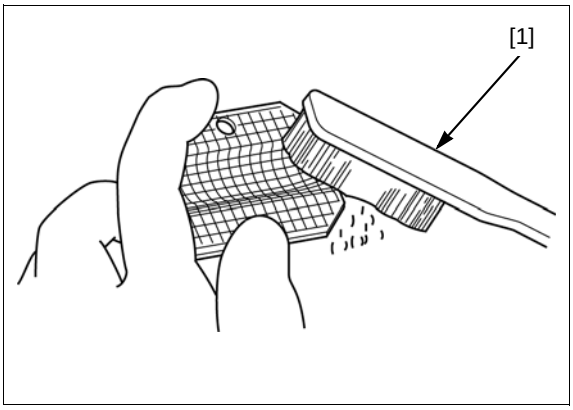
Remove the two screws (4 x 6 mm) [1] from the spark arrester [2], and remove the spark arrester from the muffler.



Check for carbon deposits around the exhaust port and spark arrester. Clean if necessary, with a wire brush [1].

Replace the spark arrester if there are any breaks or tears.

Installation is in the reverse order of removal.



IDLE SPEED CHECK/ADJUSTMENT

Remove any hoses attached to the suction and discharge ports.

Remove the housing fill plug.

NOTICE

Running the engine with the housing dry will damage the pump.

Fill the housing with water and reinstall the fill plug.

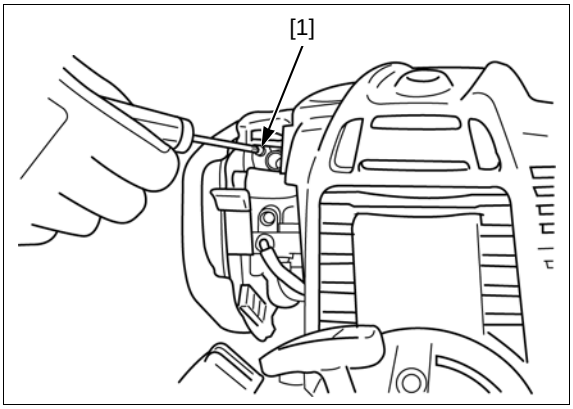
Use a tachometer with graduations of 50 min^{-1} (rpm) or smaller that will accurately indicate 50 min^{-1} (rpm) change.

Start the engine and then move the throttle lever to the idle position.

Allow it to warm up to normal operating temperature. Then, adjust the idle speed by turning the throttle stop screw [1] right or left.

IDLE SPEED: 4,100 ± 200 min^{-1} (rpm)

Once completed, drain the water from the housing.



VALVE CLEARANCE CHECK/ADJUSTMENT

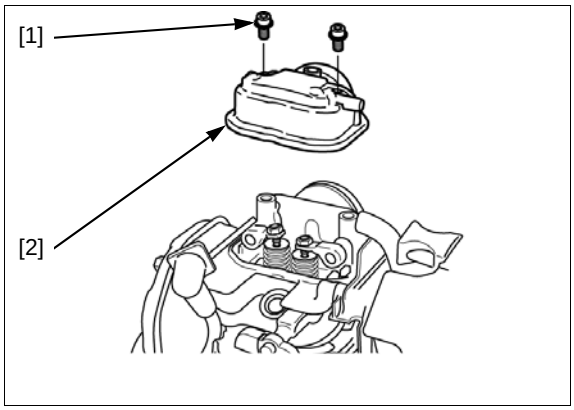
Valve clearance inspection and adjustment must be performed with the engine cold.

Remove the top cover (page 5-2).

Disconnect the spark plug cap from the spark plug.

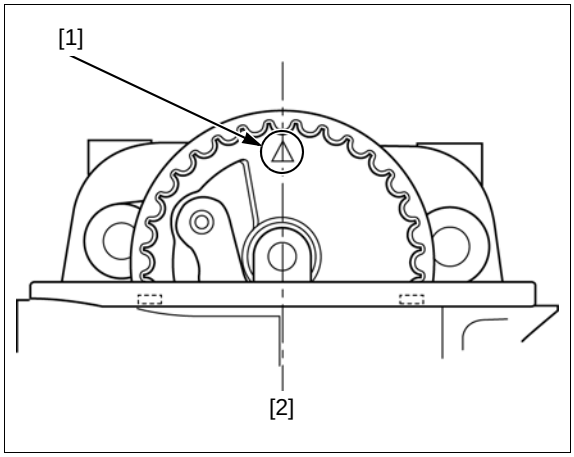
Remove the two socket bolts [1] and head cover [2].

- Engine oil can leak out when removing the head cover. Catch the leaking oil with a suitable material and wipe up the area immediately.



Set the piston at top dead center of the compression stroke. Align the " △ " mark [1] on the cam pulley with the cylinder head center [2].

If the exhaust valve and intake valve are opened, align the mark on the starter pulley with the mark on the fan cover again by rotating the engine 360°.



Insert a feeler gauge [1] between the valve rocker arm [2] and valve stem [3] to measure the valve clearance.

VALVE CLEARANCE:
IN: 0.08 ± 0.02 mm
EX: 0.11 ± 0.02 mm

If adjustment is necessary, proceed as follows.

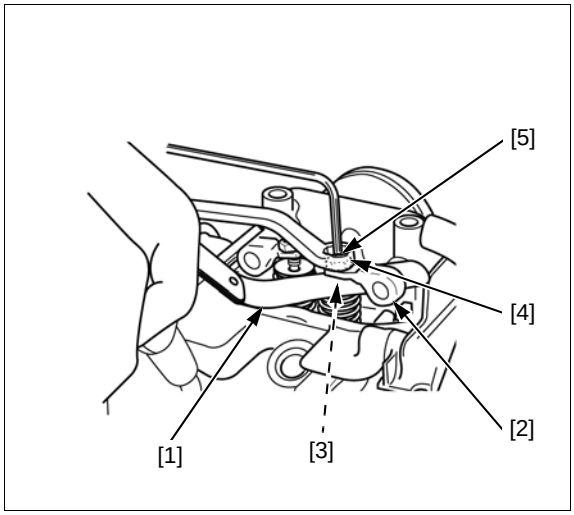
Loosen the valve adjusting lock nut [4] and adjust the valve clearance by turning the adjusting screw [5] right or left.

Hold the valve adjusting screw and tighten the valve adjusting screw lock nut to the specified torque.

TORQUE: 4.9 N·m (0.50 kgf·m, 3.6 lbf·ft)

Recheck the valve clearance, and if necessary, readjust the clearance.

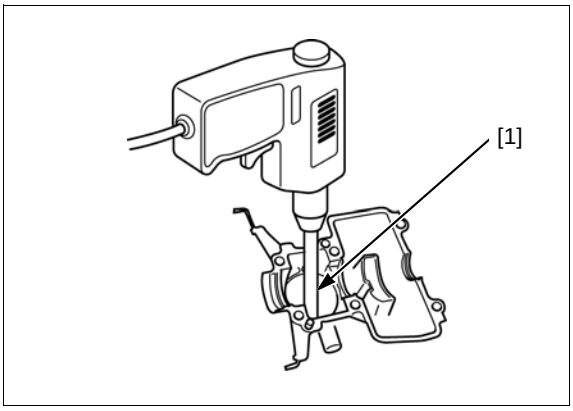
Install the head cover and top cover.



COMBUSTION CHAMBER CLEANING

Prepare a cylinder of thick paper or equivalent material, with a diameter large enough to fit against the inner wall of the cylinder, and insert it into the cylinder for protection.

Attach a commercially available cleaning brush [1] to an electric drill and clean the combustion chamber.



NOTICE

- *Clean the combustion chamber when the valves have been installed in the cylinder block.*
- *Be sure to insert thick paper into the cylinder to protect the inner wall of the cylinder when cleaning the combustion chamber.*
- *Do not press the cleaning brush with force against the combustion chamber.*

FUEL TANK/FUEL FILTER CLEANING FUEL TUBES CHECK

⚠WARNING

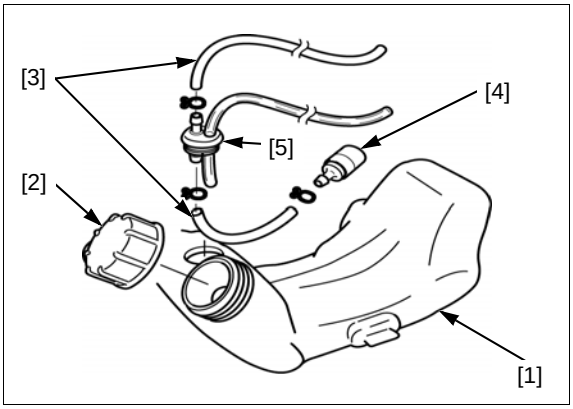
Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Keep heat, sparks and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

Remove the fuel tank [1] (page 6-2).

Remove the following from the fuel tank.

– Fuel tank cap [2]
– Fuel tube [3]
– Fuel filter [4]
– Grommet [5]



FUEL TANK CLEANING

Wash inside the fuel tank with nonflammable solvent to remove any foreign material and water from the tank.

FUEL TUBES CHECK

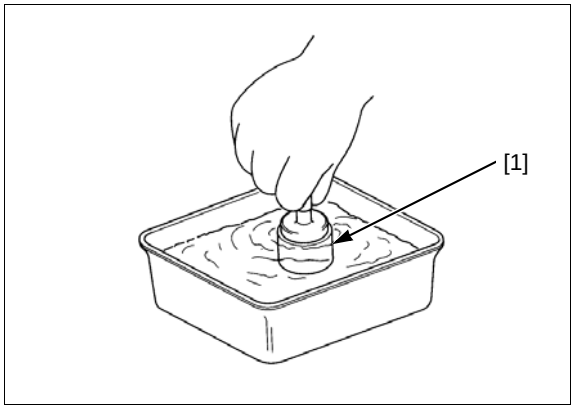
Check the fuel tube and grommet for deterioration, hardening, cracks or signs of leakage.

Replace if necessary.

FUEL FILTER CLEANING

Clean the fuel filter [1] with solvent and allow it to dry thoroughly.

Replace the fuel filter if it is contaminated.



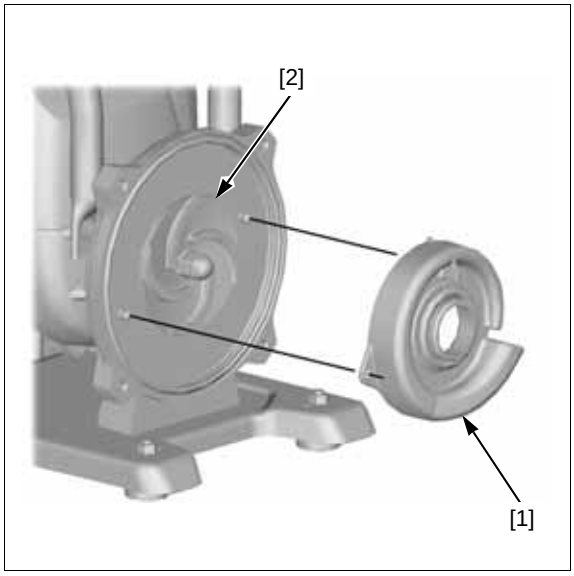
Installation is in the reverse order of removal.

After Installation, check for any sign of fuel leakage.

IMPELLER CHECK

Remove the volute case [1] (page 10-4).

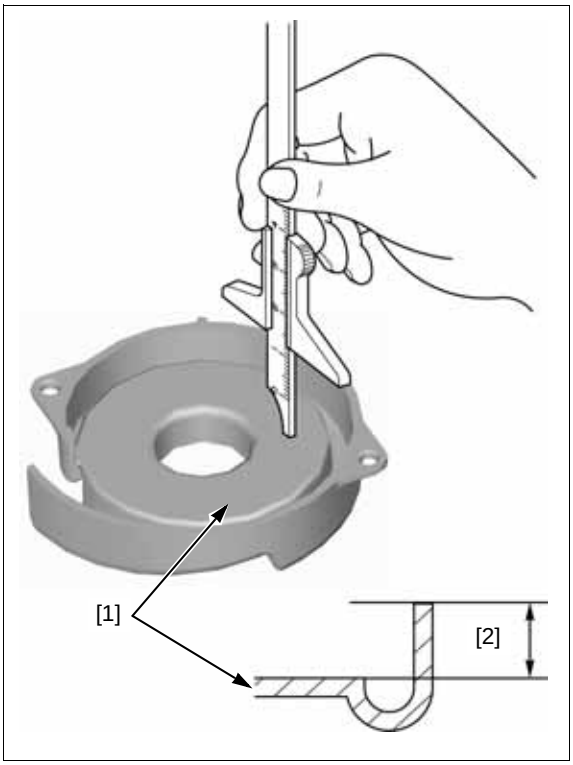
Check the volute [1] and impeller [2] for damage or excessive wear and replace if necessary.



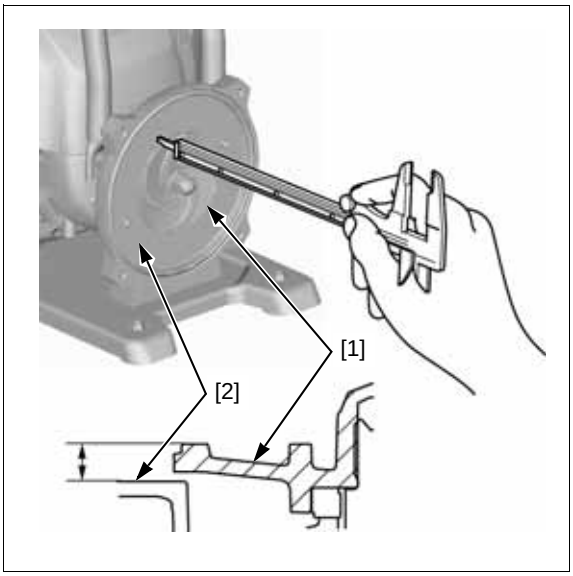
IMPELLER CLEARANCE CHECK

Remove the volute case [1] (page 10-4).

Measure the depth [2] of the volute case by using the depth gauge or vernier caliper.



Measure the height of the impeller vanes [1] from the casing cover [2].

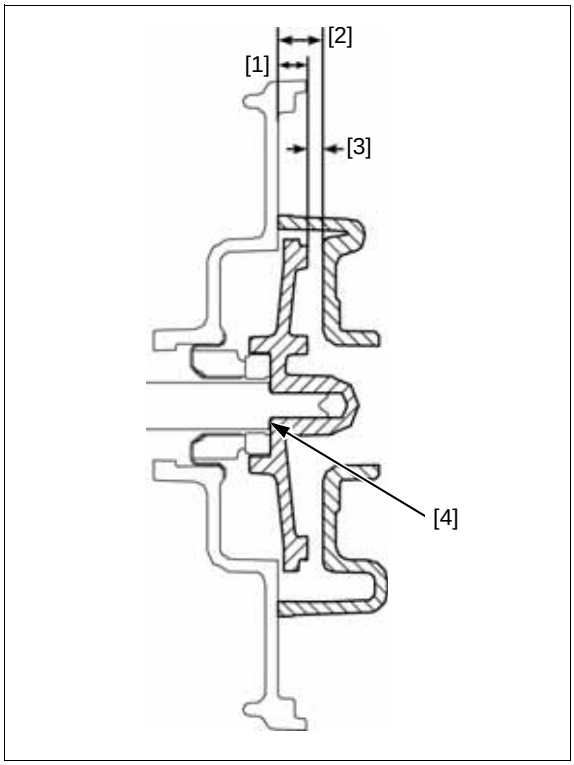


Subtract the height of the impeller [1] from the depth of the volute case [2] to obtain the impeller clearance [3].

IMPELLER CLEARANCE:
0.70 – 1.00 mm (0.028 – 0.039 in)

If the clearance is not within specification, adjust the clearance by adding or removing adjuster shims [4] (page 10-5).

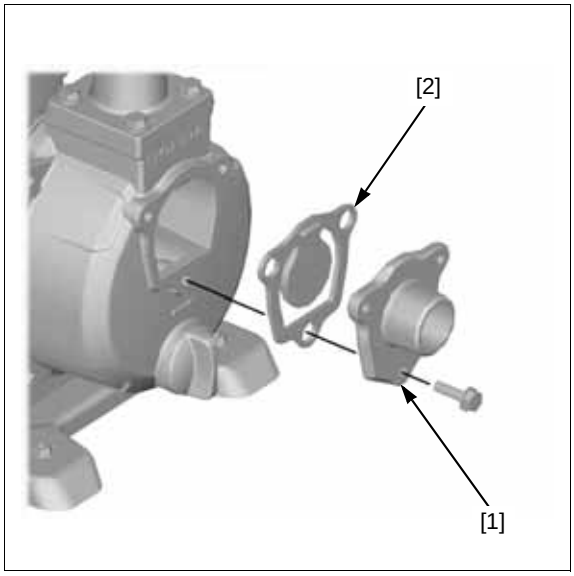
SHIM THICKNESS: 0.3 mm (0.012 in)



PUMP INLET VALVE CHECK

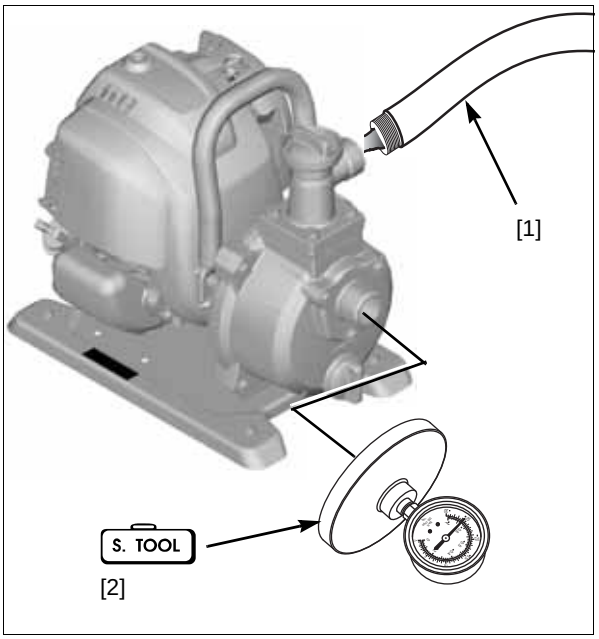
Remove the inlet pipe [1] (page 10-3).

Check the pump inlet valve [2] for damage or excessive wear and replace if necessary.



PUMP VACUUM TEST

Test Procedure



Install thread tape or sealant to the vacuum gauge and install in the base plate.

Position a garden hose [1] so a steady stream of water flows into the discharge port during the test.

Start the engine, position the throttle lever in the FAST position and allow the engine to warm up for several minutes.

Adjust the throttle lever to the maximum position.

Position the vacuum tester [2] against the suction port to obtain the vacuum reading.

MINIMUM VACUUM: 22 in.Hg at sea level

Vacuum reading will decrease by approximately 1 in.Hg per 1000 ft increase in elevation.

Shut off the engine and confirm the vacuum gauge reading remains steady. This verifies the intake flapper is sealing.

Test Results

If the vacuum gauge does not remain steady after shutting off the engine, remove any fittings from the suction port (if installed) and retest. If the vacuum gauge is still unsteady, disassemble and inspect the flapper for wear or damage.

A vacuum reading below 22 in.Hg (at sea level) indicates a problem with the pump. If the vacuum reading is low, inspect the:

- Impeller and volute for damage or wear
- Impeller/volute clearance
- Mechanical seal for damage
- Pump case housing and O-rings for damage or leaks

If the pump does not prime, but the vacuum reading is good, there is likely an air leak in the suction hose or fittings, or the suction head is too high.

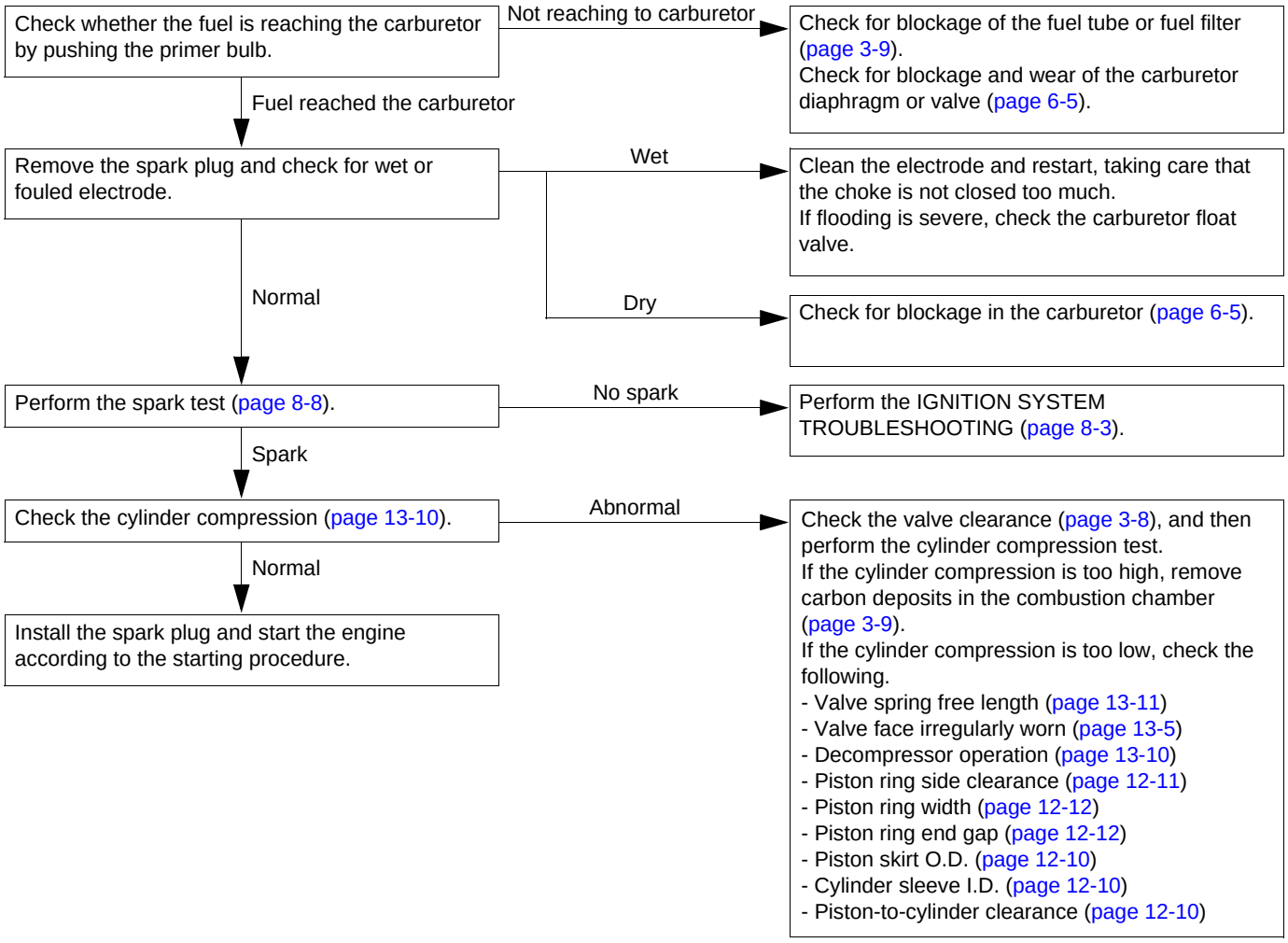
4. TROUBLESHOOTING

BEFORE TROUBLESHOOTING

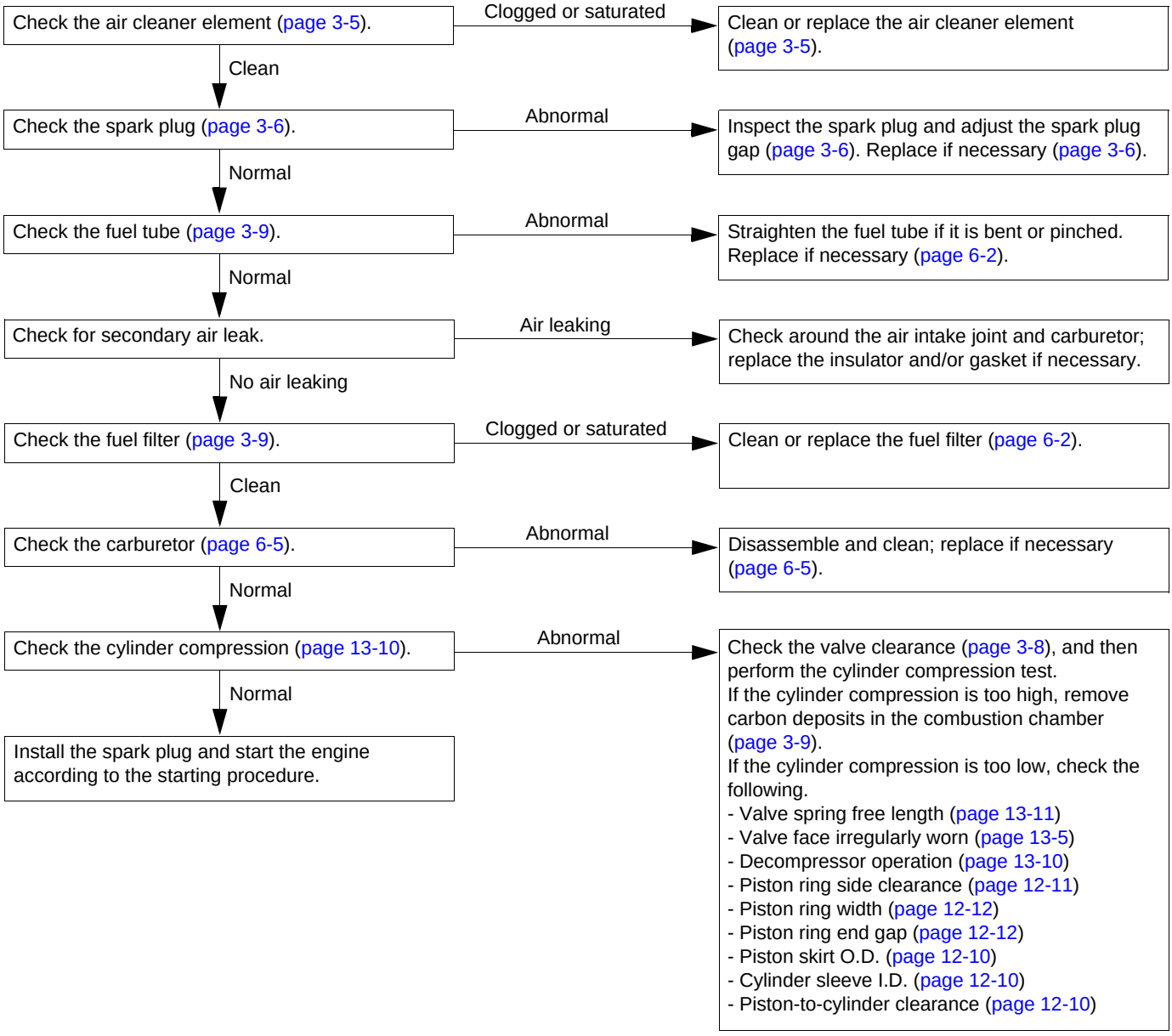
- Check that the connectors are connected securely.
- Check for sufficient fresh fuel in the fuel tank.
- Read the circuit tester's operation instructions carefully, and observe the instructions during inspection.

ENGINE TROUBLESHOOTING

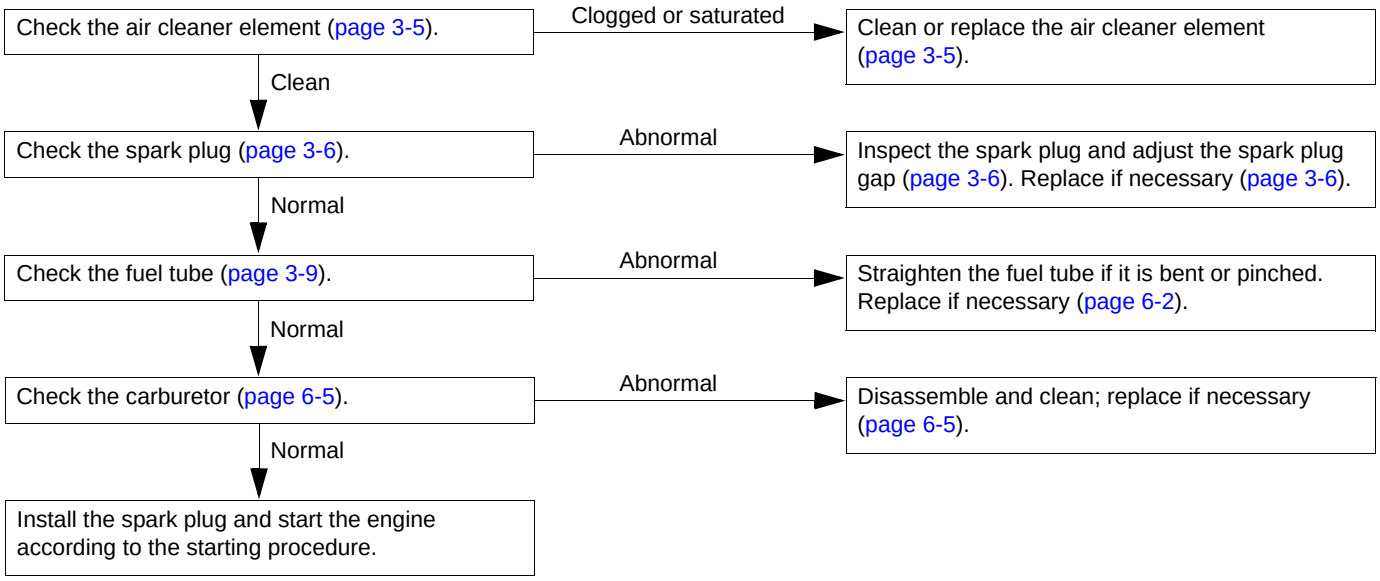
HARD STARTING



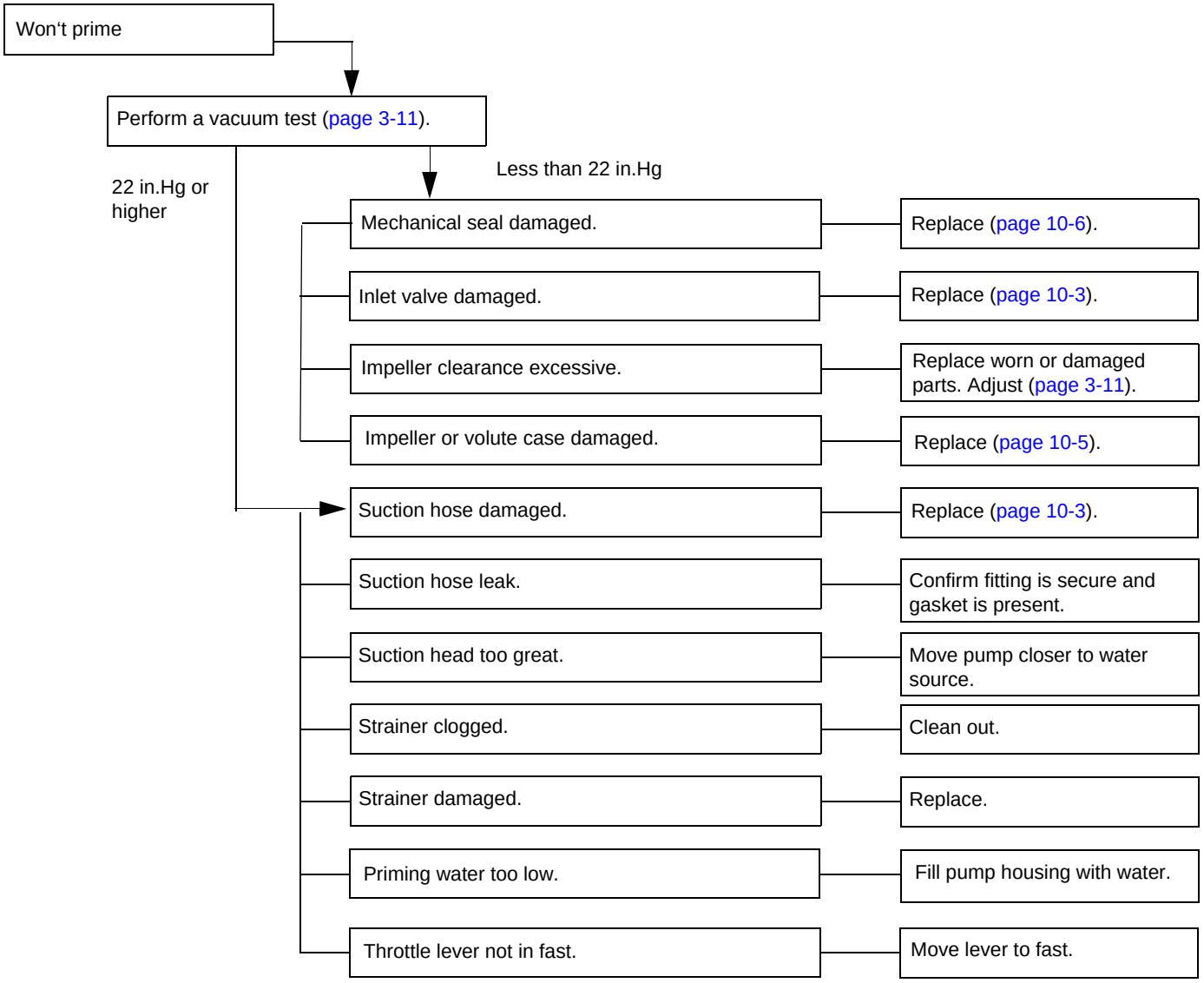
POOR PERFORMANCE AT LOW SPEED



POOR PERFORMANCE AT HIGH SPEED

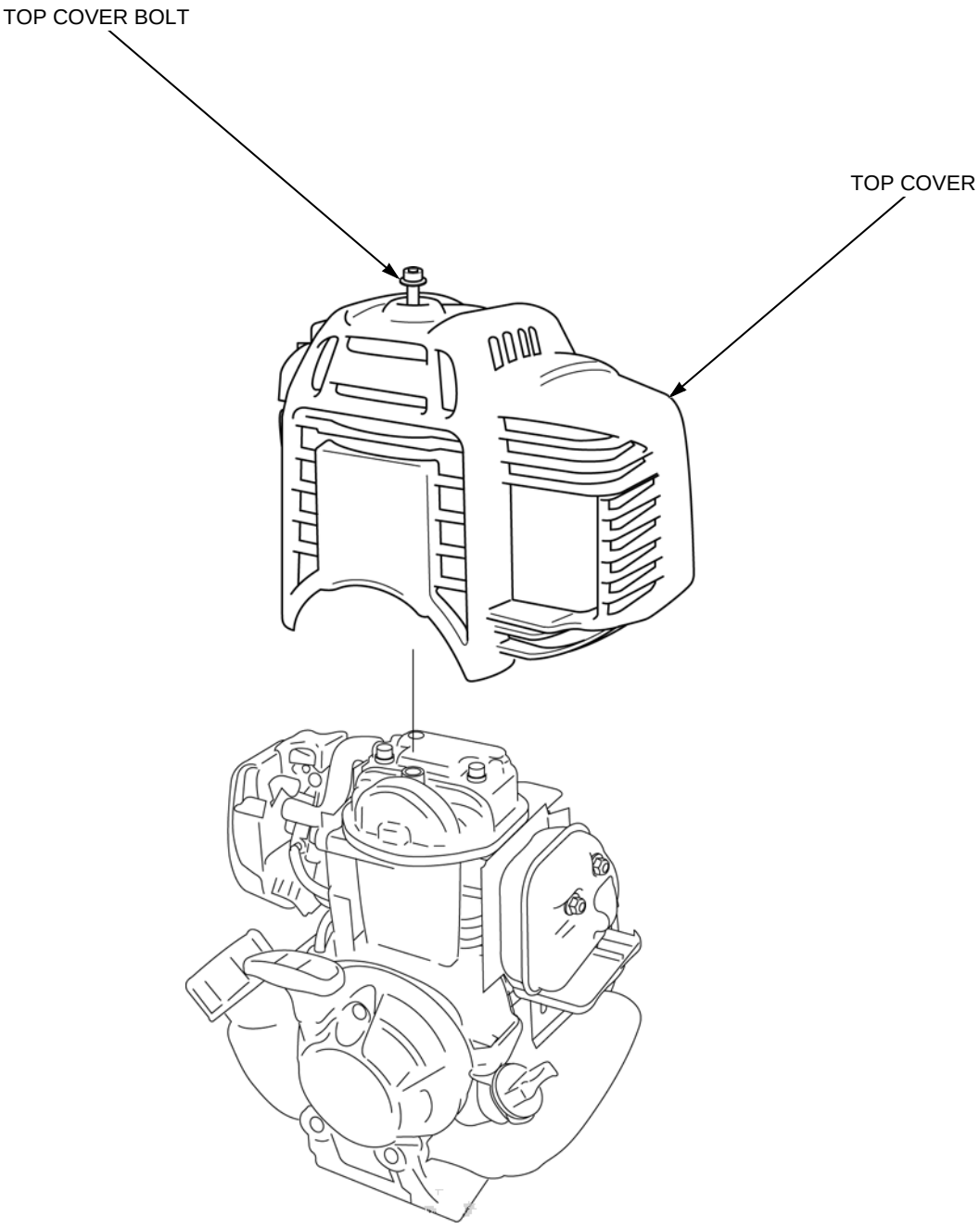


WATER PUMP TROUBLESHOOTING



Discharge volume or pressure too low	Suction hose air leak.	Check coupling for proper gasket. Tighten parts.
	Strainer clogged.	Clean out.
	Suction hose damaged.	Replace.
	Mechanical seal damaged.	Replace (page 10-6).
	Impeller clearance excessive.	Replace worn or damaged parts. Adjust (page 3-11).
	Impeller or volute case damaged.	Replace (page 10-3).
	Lift head too high.	Reduce discharge head.
	Pump RPM too low.	Move throttle lever fast position. Check throttle lever adjustment (page 7-4).
	Suction/discharge hoses too long.	Correct.
	Suction head too great.	Move pump closer to water source.
Noise or vibration	Mounting bolts loose.	Tighten mounting bolts.
	Strainer clogged or damaged.	Clean or replace.
	Suction head too high.	Correct.
	Suction hose too long.	Correct.
	Suction hose collapsed.	Replace with proper reinforced hose.
	Debris inside pump.	Disassemble, inspect, and remove debris.

TOP COVER REMOVAL/INSTALLATION



FUEL TANK REMOVAL/INSTALLATION

⚠ WARNING

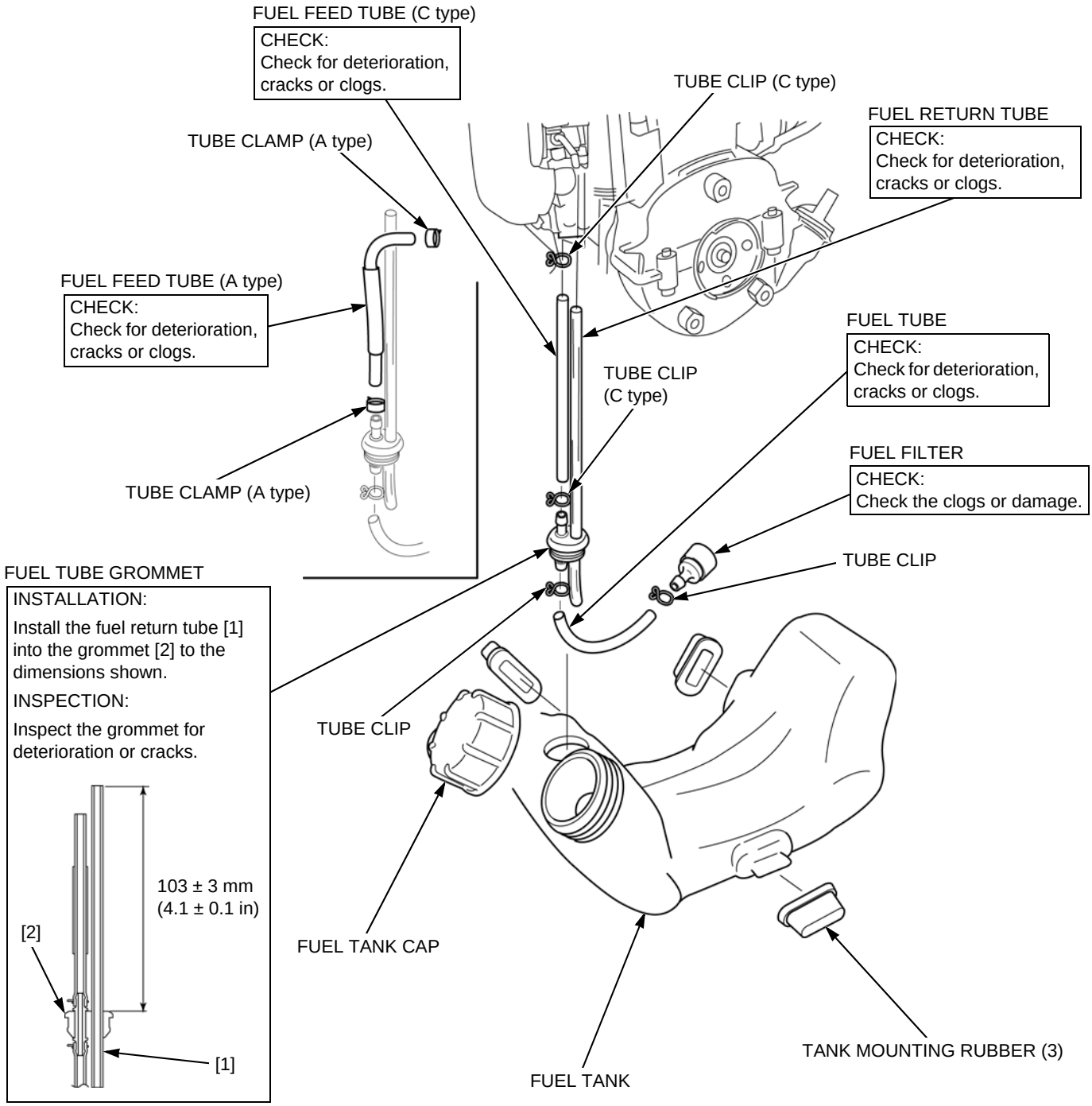
Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

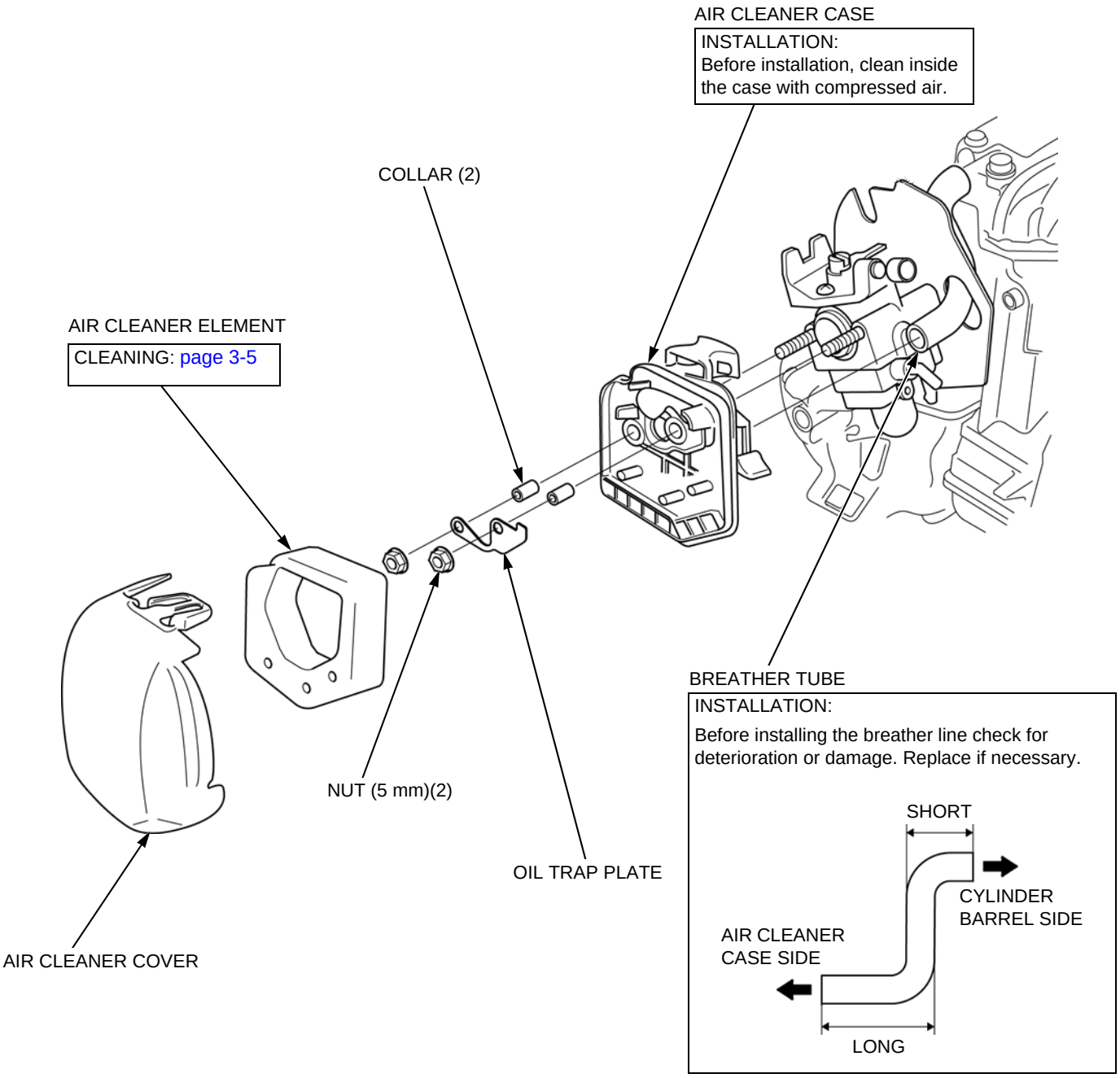
Remove the recoil starter (page 9-2).

Remove the engine from engine bed (page 11-2).

Drain the fuel completely from fuel tank and fuel tube.



AIR CLEANER
REMOVAL/INSTALLATION



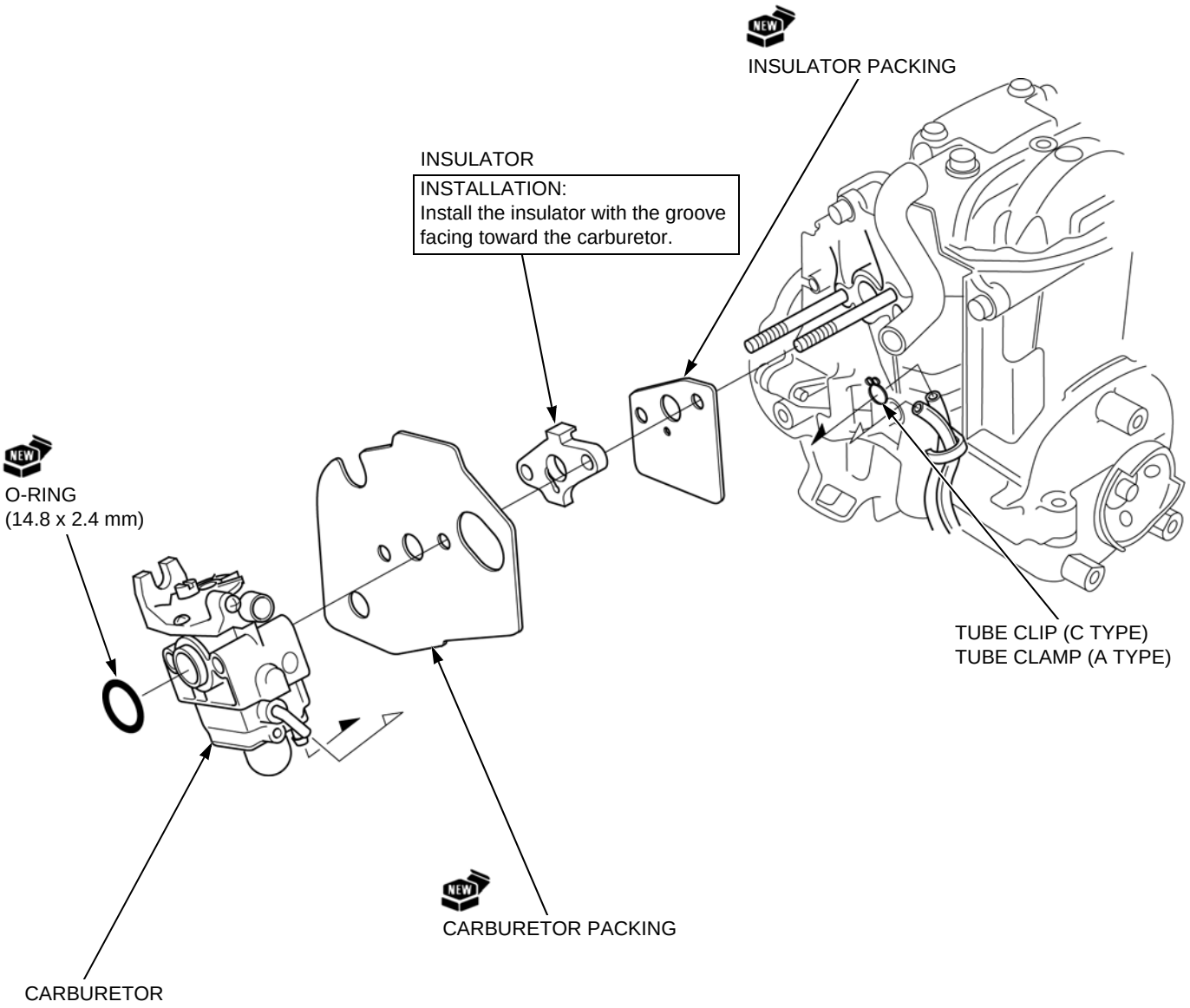
CARBURETOR REMOVAL/INSTALLATION

⚠ WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

Remove the air cleaner (page 6-3).



CARBURETOR DISASSEMBLY/ASSEMBLY

⚠WARNING

Gasoline is highly flammable and explosive. You can be burned or seriously injured when handling fuel.

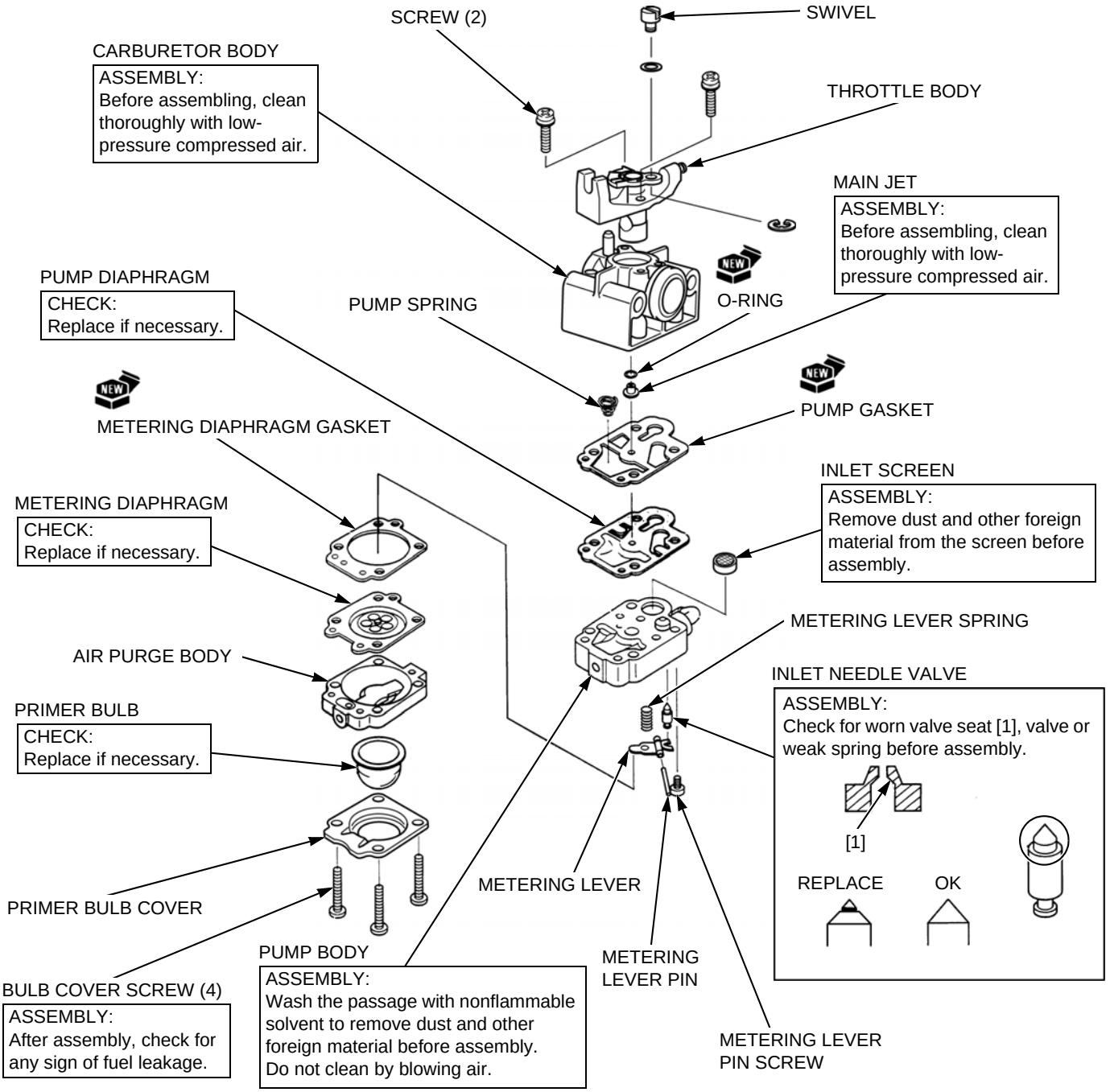
- Keep heat, sparks, and flame away.
- Handle fuel only outdoors.
- Wipe up spills immediately.

NOTICE

Tampering is a violation of Federal and California law.

Remove the carburetor (page 6-4).

Before disassembly, clean the outside of the carburetor.



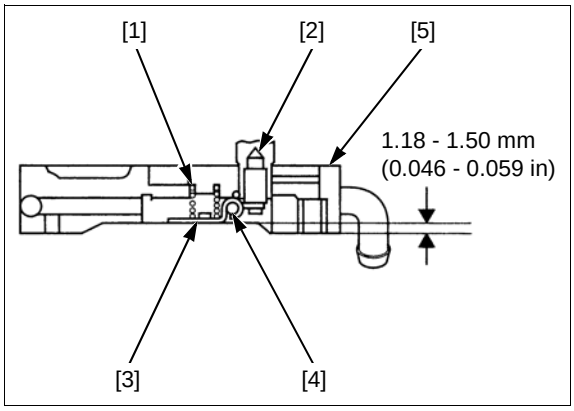
METERING LEVER ADJUSTMENT

Install the metering lever spring [1], inlet needle valve [2], metering lever [3], metering lever pin [4] and metering lever pin screw on the pump body [5].

Measure the gap between the metering lever surface and the pump body surface.

METERING
LEVER HEIGHT: 1.18 – 1.50 mm (0.046 - 0.059 in)

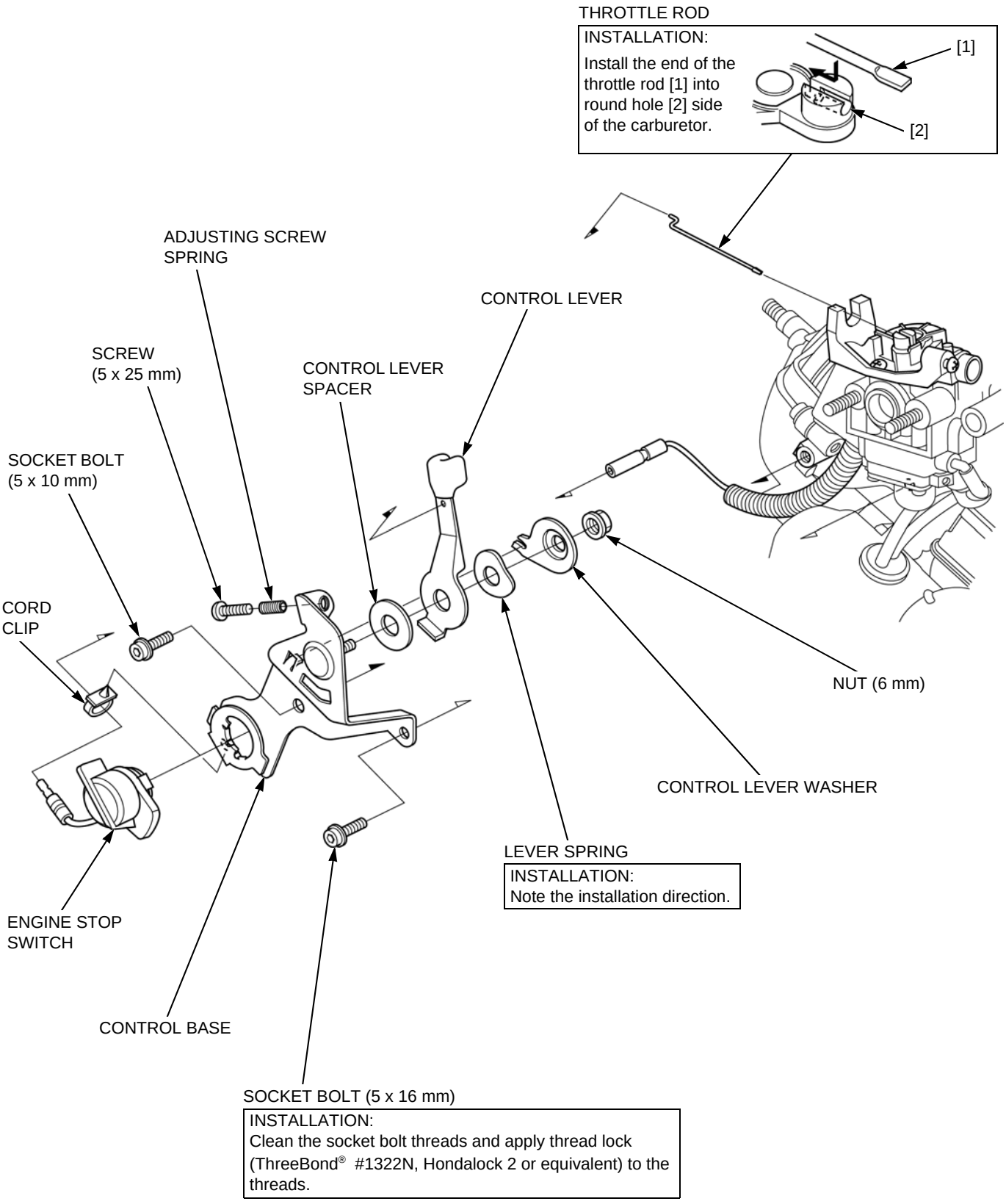
If the measurement is outside the specification, adjust by bending the metering lever.



7. CONTROL SYSTEM

CONTROL BASE/ENGINE STOP SWITCH REMOVAL/INSTALLATION

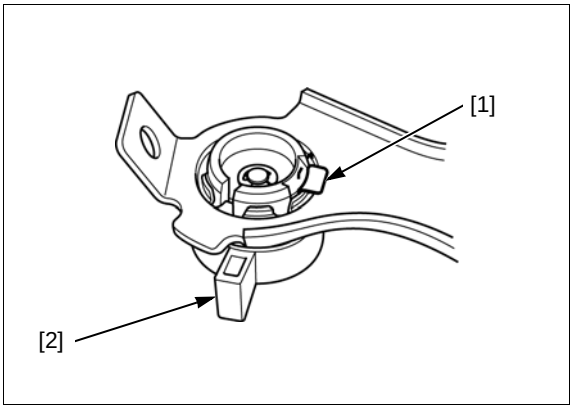
Remove the air cleaner (page 6-3).



ENGINE STOP SWITCH REMOVAL/INSTALLATION

REMOVAL

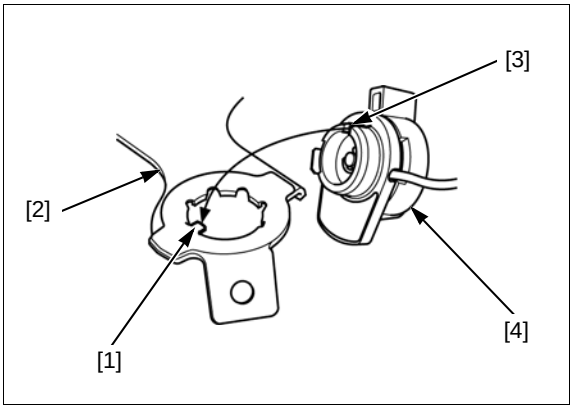
Raise the tab [1] with a screwdriver, and remove the engine stop switch [2].



INSTALLATION

Align the projection [1] on the control base [2] with the groove [3] in the engine stop switch [4].

Bend the tab as shown.



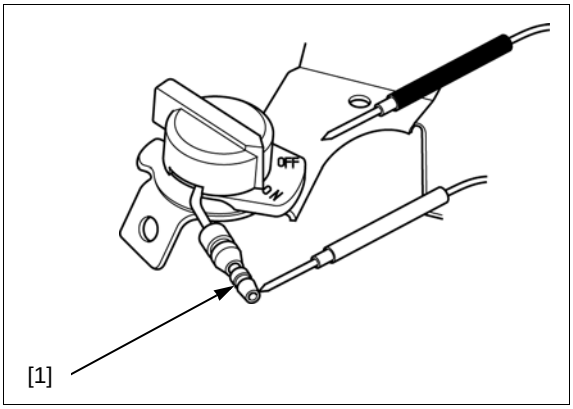
ENGINE STOP SWITCH INSPECTION

Remove the engine stop switch connector [1].

Check the continuity between the terminals at each switch position.

Switch position	Continuity
ON	No
OFF	Yes

If the correct continuity is not obtained, replace the engine stop switch (page 7-2).

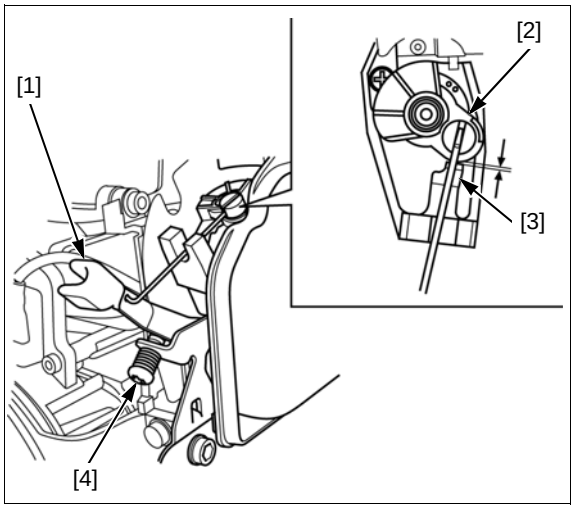


THROTTLE LEVER ADJUSTMENT

Remove the air cleaner cover (page 6-3).

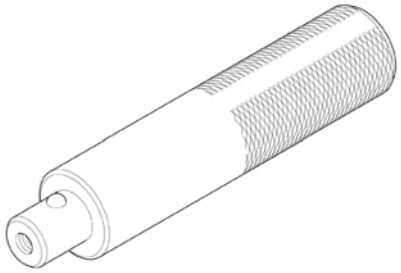
Move the throttle lever [1] slowly by pushing it down to the "HIGH SPEED" side until it brings the carburetor throttle valve [2] to the position where the clearance at the stopper [3] is 0.5 - 1.0 mm (0.02 - 0.04 in).

Check that the adjusting screw [4] end is in contact with the stopper or the throttle lever. If it is not, adjust by turning the adjusting screw.

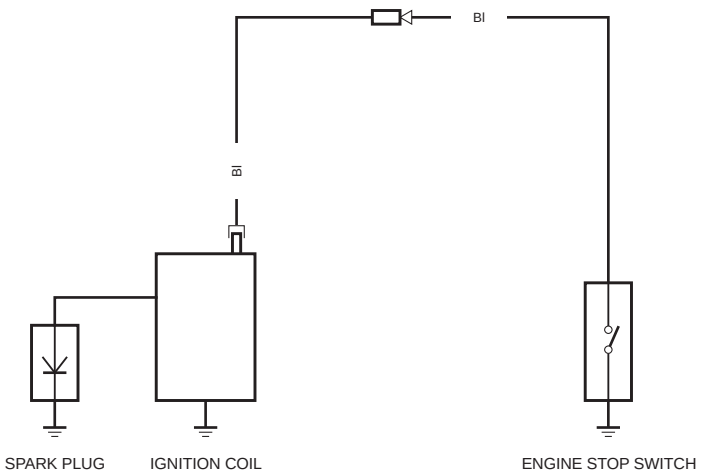


8. IGNITION SYSTEM

TOOLS

Pilot, 12 mm 07746-0040200 	Driver 07749-0010000 	Attachment, 28 x 30 mm 07946-1870100 

SYSTEM DIAGRAM



ENGINE STOP SWITCH

	IG	E
OFF	○	○
ON		

Bl	Black	Br	Brown
Y	Yellow	O	Orange
Bu	Blue	Lb	Light blue
G	Green	Lg	Light green
R	Red	P	Pink
W	White	Gr	Gray

IGNITION SYSTEM TROUBLESHOOTING

NO OR WEAK SPARK AT SPARK PLUG

Check the following before troubleshooting:

– Loose connectors
– Spark plug (page 3-6)

Check the engine stop switch (page 7-3).
→ Abnormal → Replace the engine stop switch (page 7-2).
↓ Normal

Check the ignition coil (page 8-8).
→ Abnormal → Replace the ignition coil (page 8-4).
↓ Normal

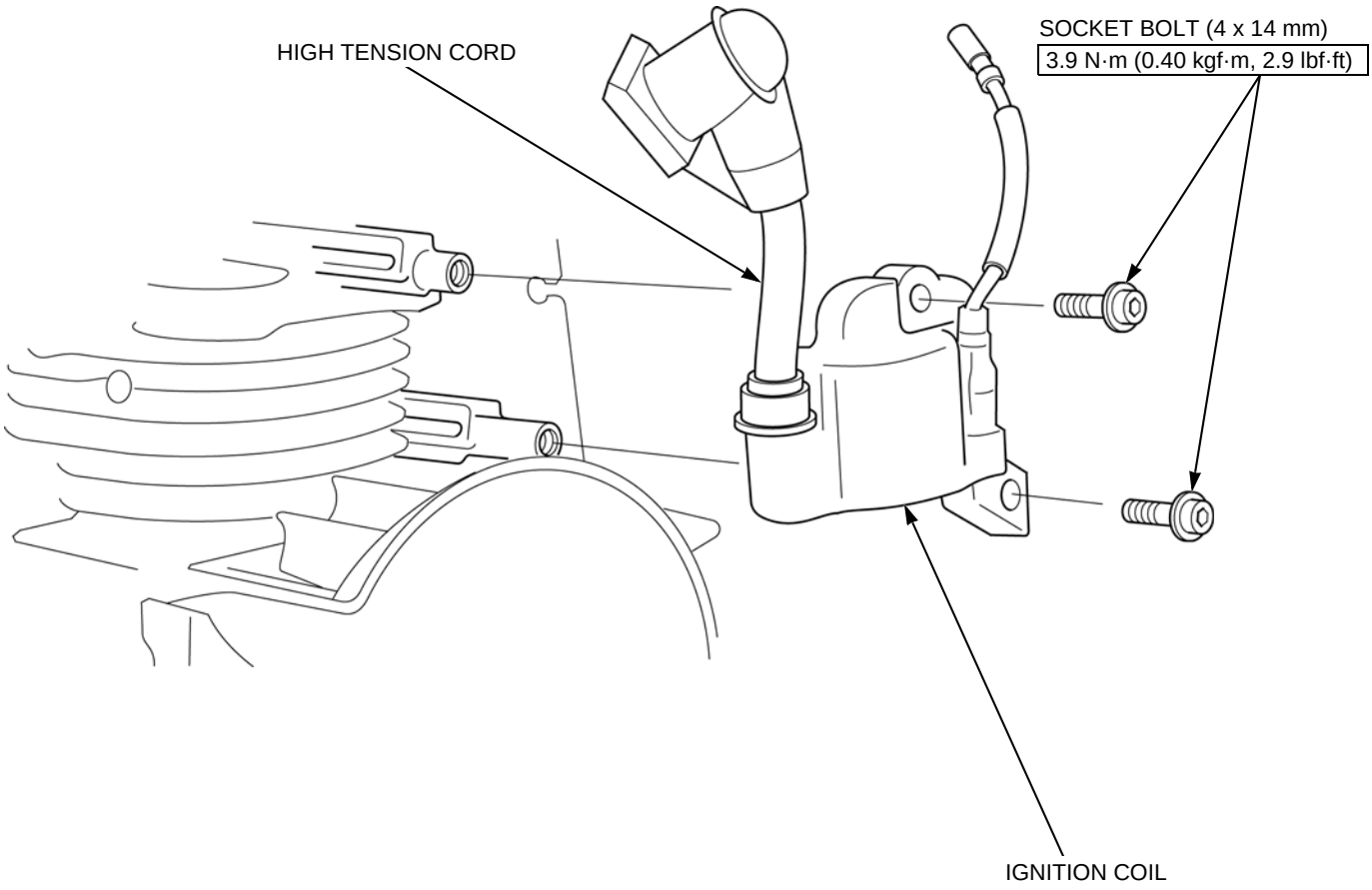
Check for continuity between the engine stop switch cord connectors.Replace if necessary.

IGNITION COIL REMOVAL/INSTALLATION

Remove the top cover (page 5-2).

NOTE:

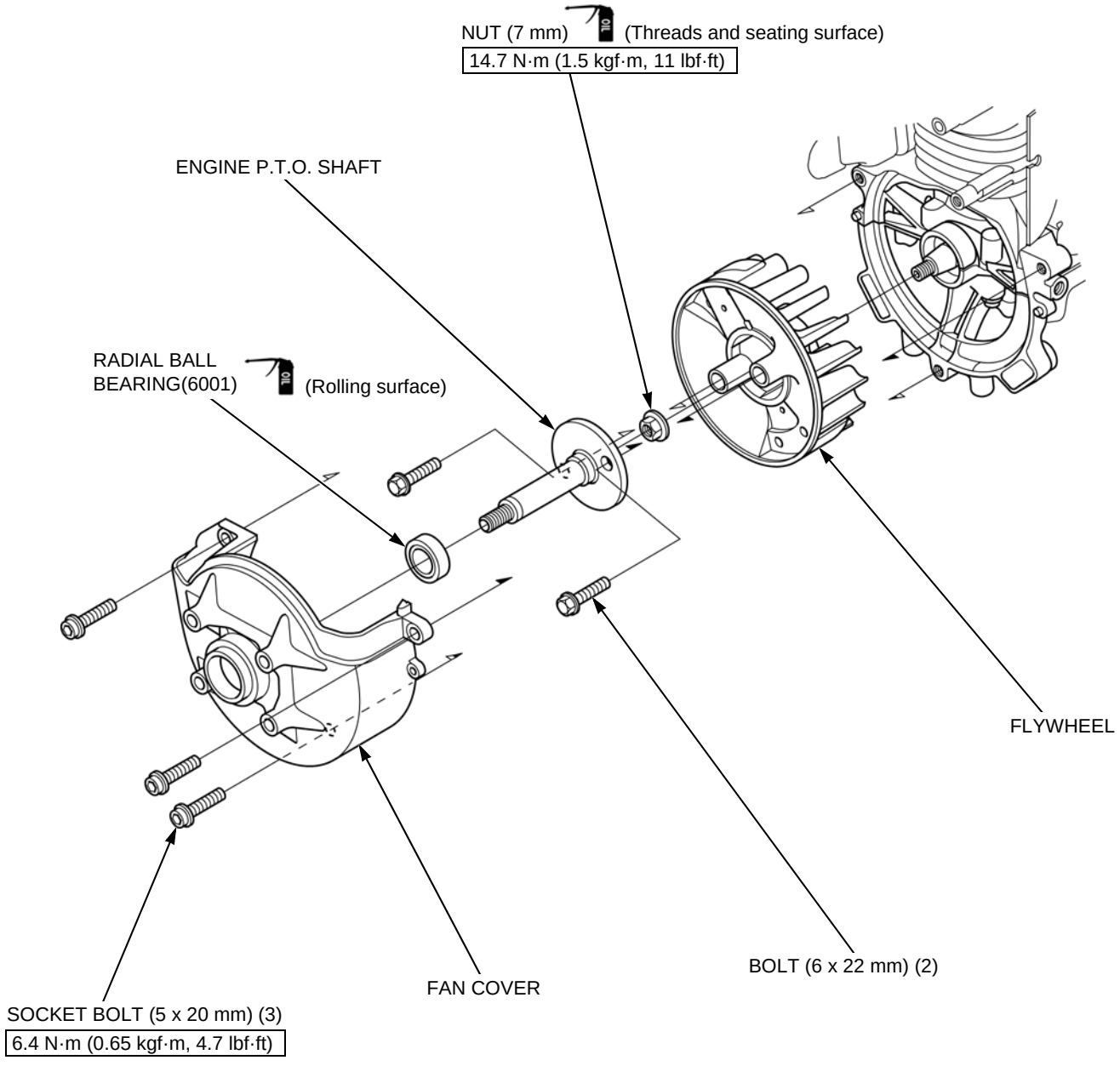
- Route the engine wire harness and high-tension code properly (page 2-6).
- After installation, check the ignition coil air gap (page 8-7).



FAN COVER/ENGINE P.T.O. SHAFT/ FLYWHEEL REMOVAL/INSTALLATION

Remove the ignition coil (page 8-4).

Remove the casing cover (page 10-5).



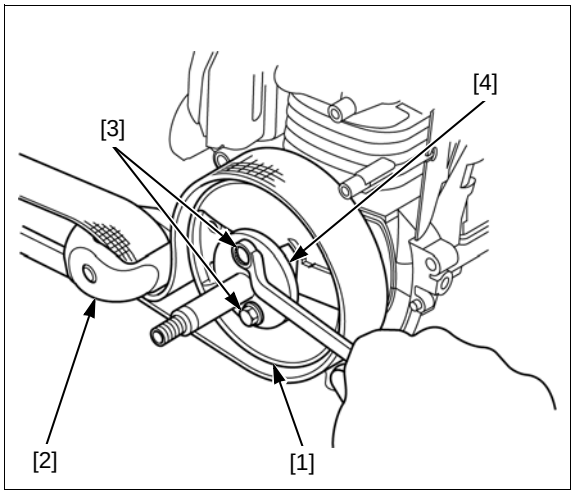
ENGINE P.T.O. SHAFT REMOVAL/INSTALLATION

NOTICE

- *To avoid flywheel fan blade damage, position the strap wrench fulcrum at the flywheel magnetic parts.*

Holding the flywheel [1] with a commercially available strap wrench [2], remove the bolt (6 x 22 mm) [3] and remove the P.T.O. shaft [4].

Installation is in the reverse order of removal.



FLYWHEEL REMOVAL/INSTALLATION

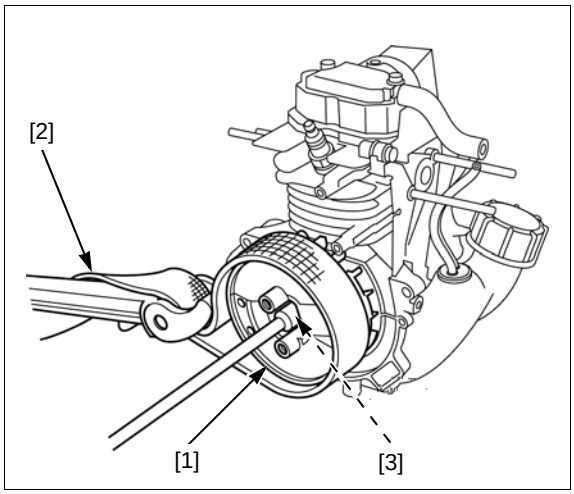
REMOVAL

NOTICE

- *To avoid flywheel fan blade damage, position the strap wrench fulcrum at the flywheel magnetic parts.*

Remove the engine P.T.O.shaft (page 8-6).

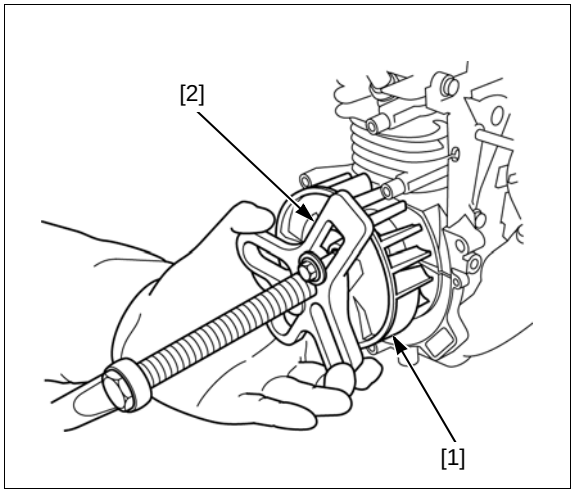
Holding the flywheel [1] with a commercially available strap wrench [2], remove the nut (7 mm) [3] from the flywheel.



Remove the flywheel [1] using a commercially available flywheel puller [2].

NOTICE

- *Do not remove the flywheel by tapping it with a hammer.*



INSTALLATION

NOTICE

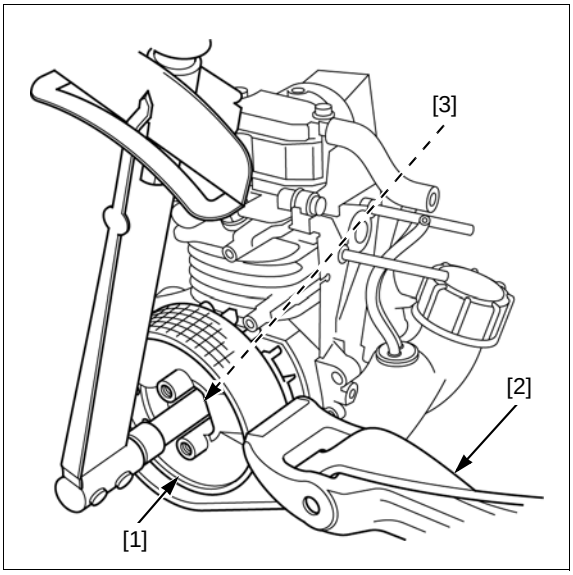
- *Clean the tapered part of dirt, oil, grease and other foreign material before installation.*
- *Be sure that there is no washer or other foreign material on the magnetic part.*

Be sure that the woodruff key is set in the key groove properly.

Holding the flywheel [1] with a commercially available strap wrench [2], tighten the nut (7 mm) [3] to the specified torque.

TORQUE: 14.7 N·m (1.5 kgf·m, 11 lbf·ft)

Install the engine P.T.O. shaft (page 8-6).



IGNITION COIL AIR GAP CHECK/ADJUSTMENT

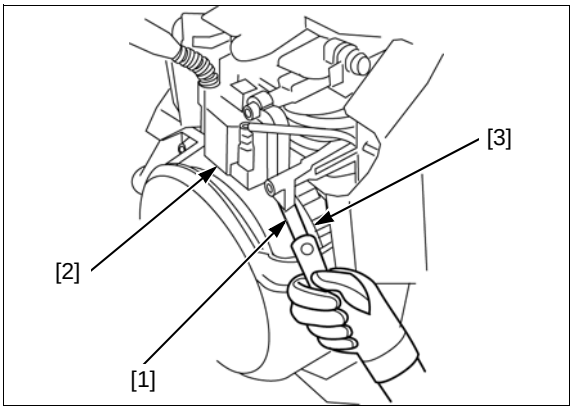
Remove the top cover (page 5-2).

Insert the feeler gauge [1] of proper thickness between the ignition coil [2] and the flywheel [3].

NOTICE

- *Check the clearance at the magnet part of the flywheel.*

IGNITION COIL AIR GAP:
0.2 – 0.4 mm (0.01 – 0.02 in)



If measured clearance is out of specification, adjust the air gap.

Loosen the two socket bolts (4 x 14 mm) [1].

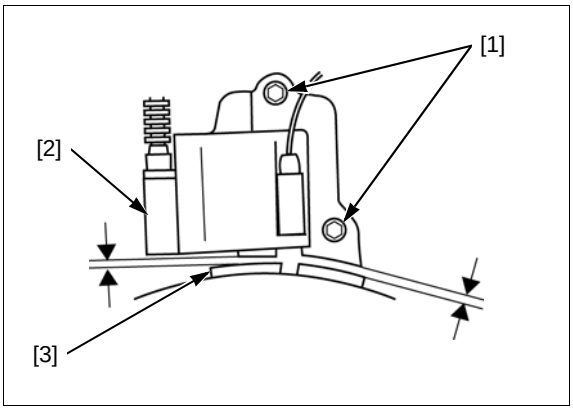
Insert the feeler gauge of proper thickness between the ignition coil [2] and magnet part [3] of the flywheel.

Push the ignition coil firmly against the magnet part of the flywheel and tighten the two socket bolts (4 x 14 mm) to the specified torque.

Remove the feeler gauge.

TORQUE: 3.9 N·m (0.40 kgf·m, 2.9 lbf·ft)

Install the top cover (page 5-2).



SPARK TEST

Check for the following before conducting the spark test.

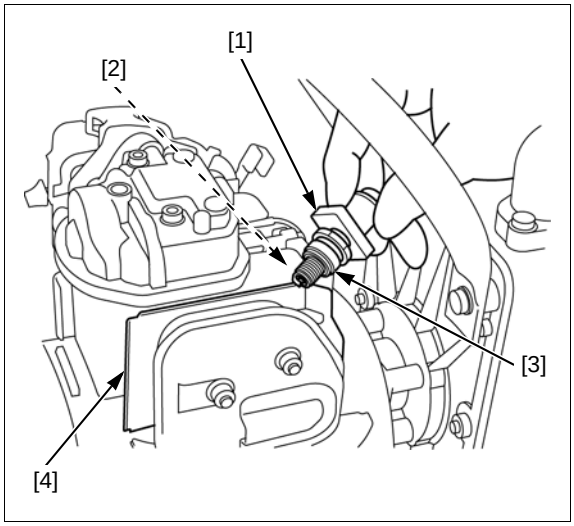
- Faulty spark plug
- Loose spark plug cap
- Water in the spark plug cap (leaking the ignition coil secondary voltage)
- Loose ignition coil connector

Disconnect the spark plug cap [1] from the spark plug [2].

Connect a known-good spark plug [3] to the spark plug cap and ground the spark plug to the air exhaust guide[4].

Turn the engine stop switch to "ON" position.

Crank the engine by pulling the recoil starter and check whether sparks jump across the electrodes.



IGNITION COIL INSPECTION

Remove the top cover (page 5-2).

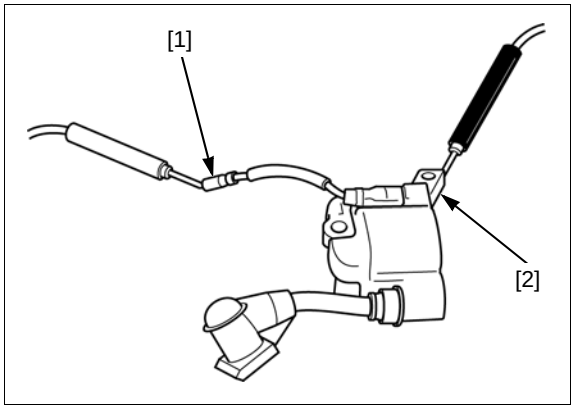
PRIMARY SIDE

Disconnect the ignition coil connector [1].

Measure the resistance of the primary coil by attaching one ohmmeter probe to the ignition coil connector and the other at the iron core [2].

RESISTANCE: 0.585 – 0.715 Ω

If measured resistance is out of specification, replace the ignition coil.

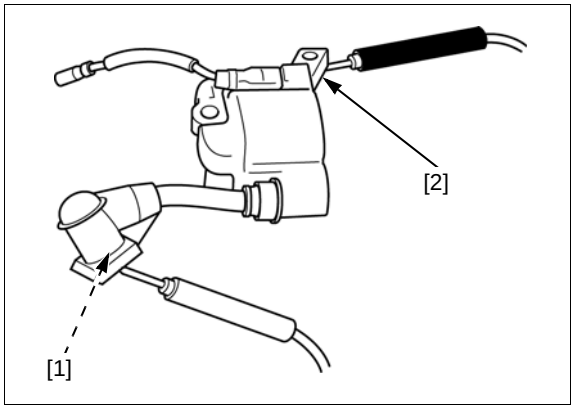


SECONDARY SIDE

Measure the resistance of the secondary coil by attaching one ohmmeter probe to the spark plug cap [1] and the other at the iron core [2].

RESISTANCE: 4.77 – 5.83 kΩ

If measured resistance is out of specification, replace the ignition coil.



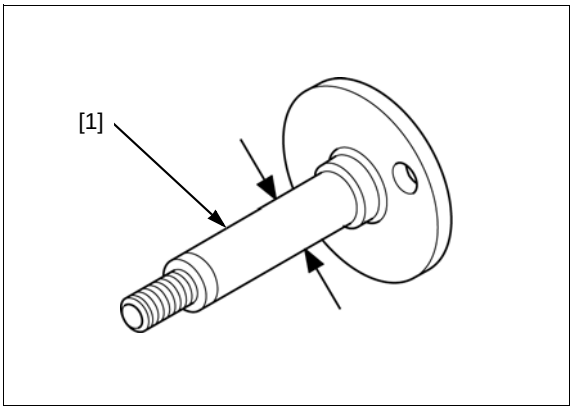
ENGINE P.T.O. SHAFT INSPECTION

Measure the engine P.T.O.shaft [1] bearing O.D.

STANDARD: 11.966 – 11.984 mm (0.4711 – 0.4718 in)

SERVICE LIMIT: 11.800 mm (0.4646 in)

If the measurement is less than the service limit, replace the engine P.T.O. shaft and fan cover bearing (6001) as a set (page 8-9).



RADIAL BALL BEARING (6001) REPLACEMENT

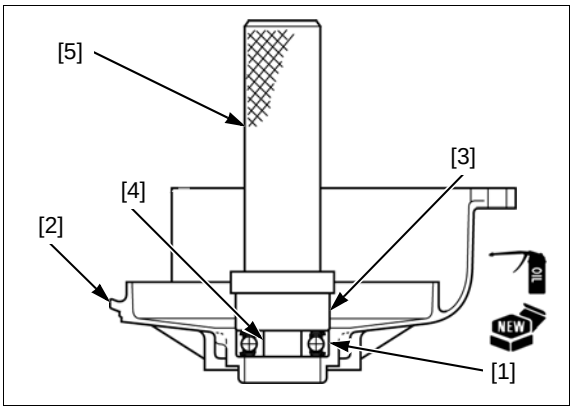
INSTALLATION

Apply oil to the inner surface and the outer surface of a new radial ball bearing [1].

Press the radial ball bearing in the fan cover [2] using the special tools.

TOOLS:

Attachment, 28 x 30 mm [3]	**07946-1870100**
Pilot, 12 mm [4]	**07746-0040200**
Driver [5]	**07749-0010000**

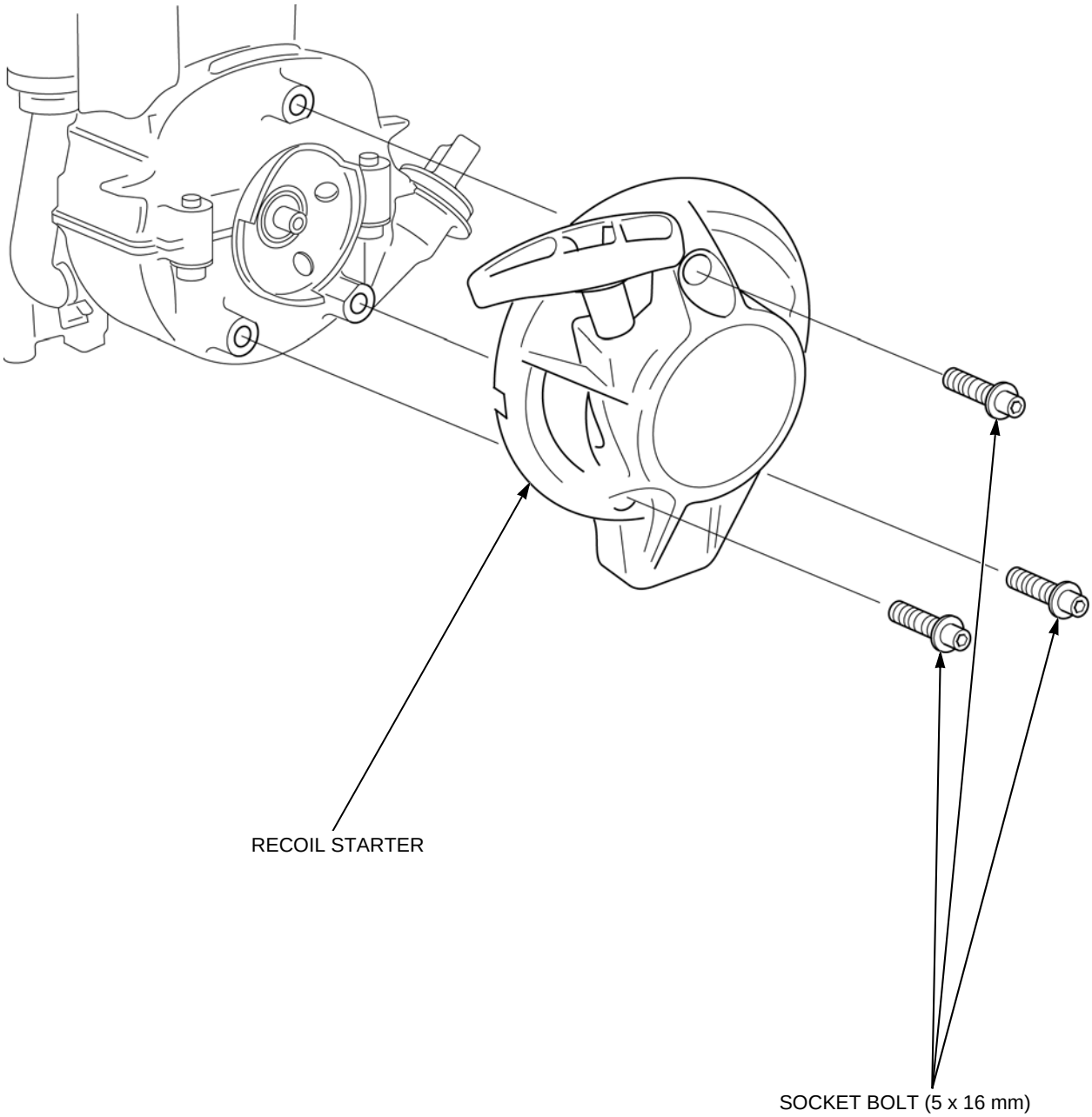


MEMO

9. STARTING SYSTEM

RECOIL STARTER REMOVAL/INSTALLATION

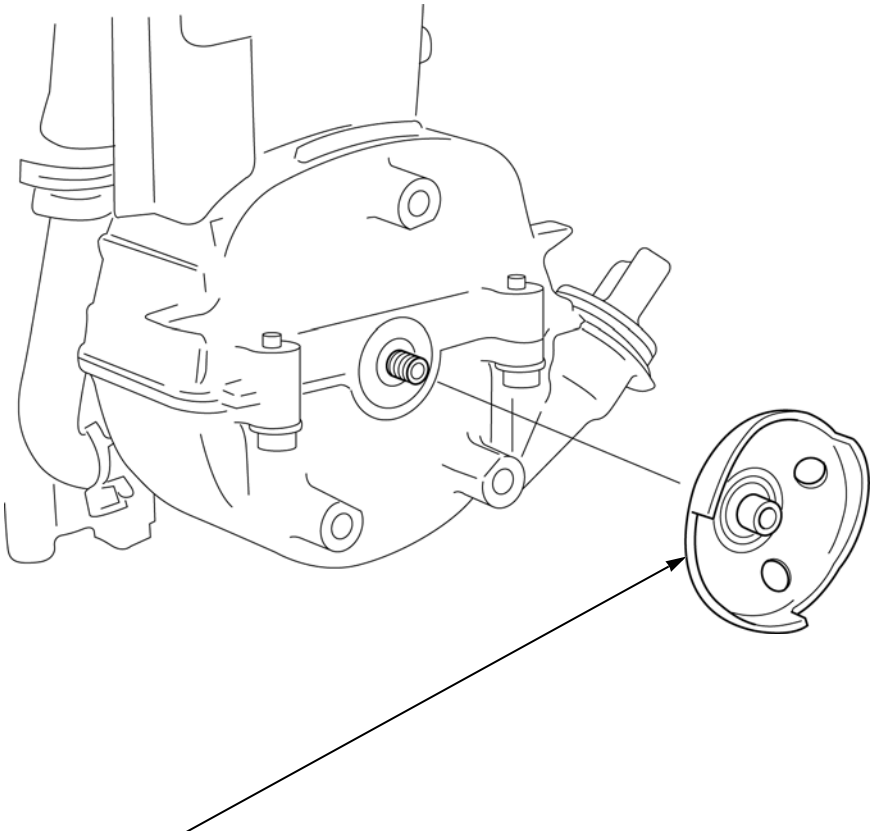
Remove the top cover (page 5-2).



STARTER PULLEY REMOVAL/INSTALLATION

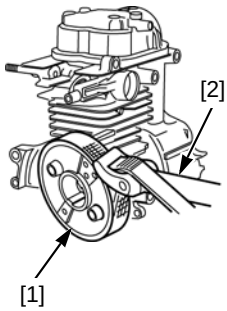
Remove the recoil starter (page 9-2).

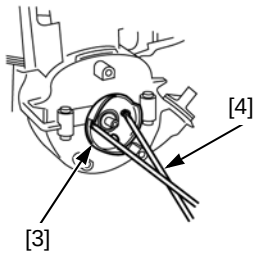
Remove the fuel tank (page 6-2).



STARTER PULLEY

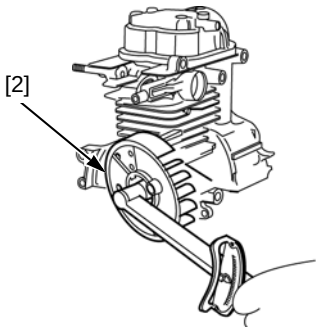
REMOVAL:
Holding the flywheel [1] with commercially available strap wrench [2], remove the recoil starter pulley [3] with a driver or equivalent tool

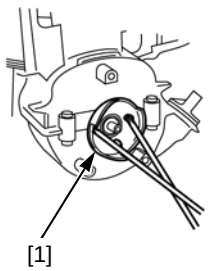




INSTALLATION:
Holding the recoil starter pulley [1] in the same manner as on disassembly, tighten the flywheel [2] to the specified torque.

14.7 N·m (1.5 kgf·m, 11 lbf·ft)





RECOIL STARTER DISASSEMBLY/ASSEMBLY

⚠CAUTION

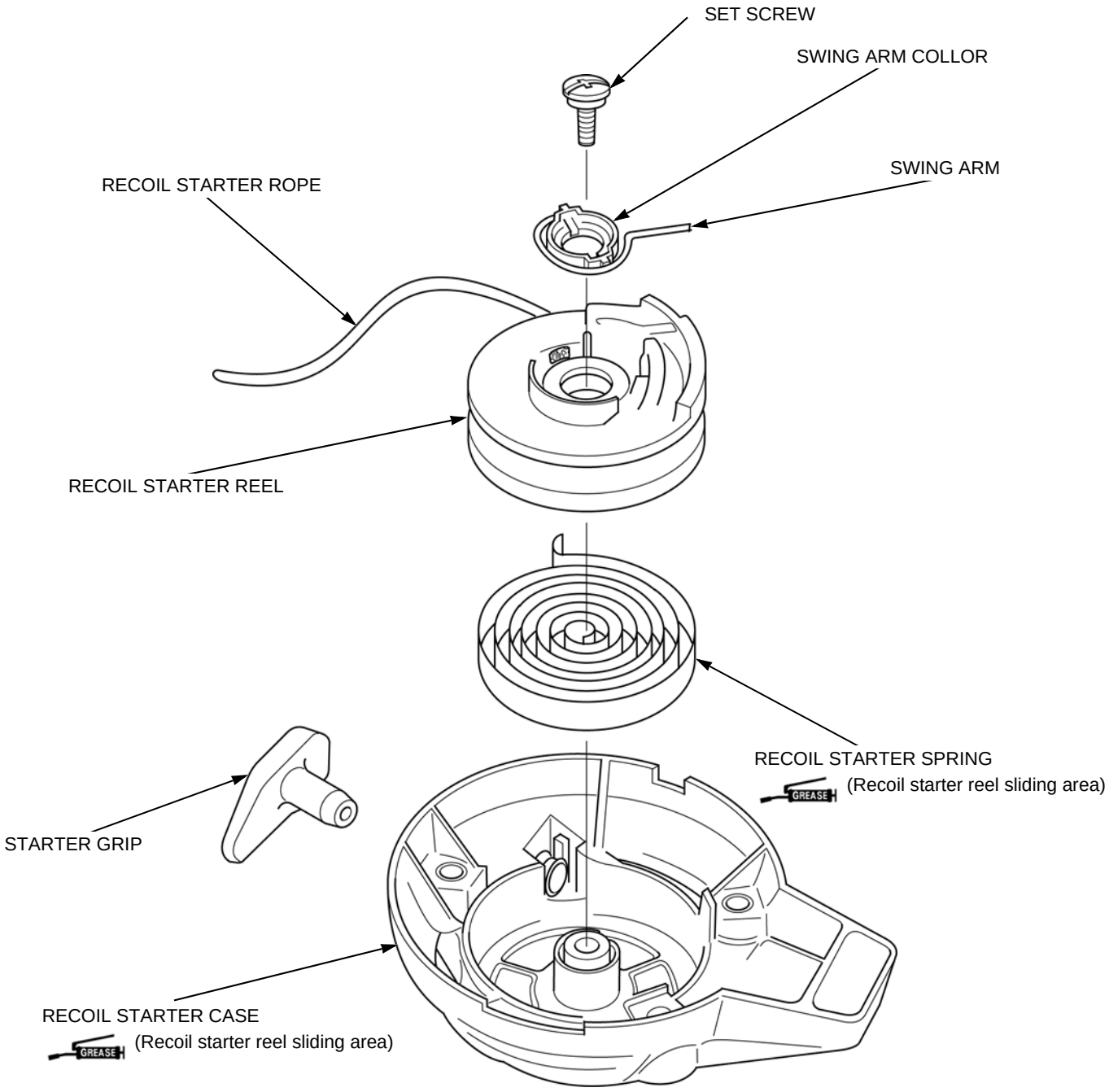
The recoil spring is wound under high tension and when released from the groove will cause sudden unwinding.

Sudden unwinding can cause severe lacerations.

Wear gloves and eye protection during this procedure and take care not to allow the spring to come out.

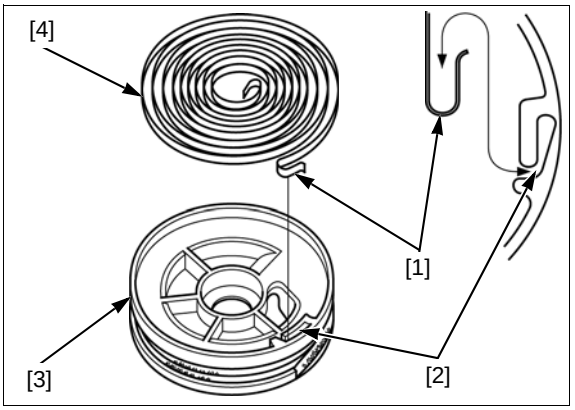
DISASSEMBLY

Remove the recoil starter (page 9-2).



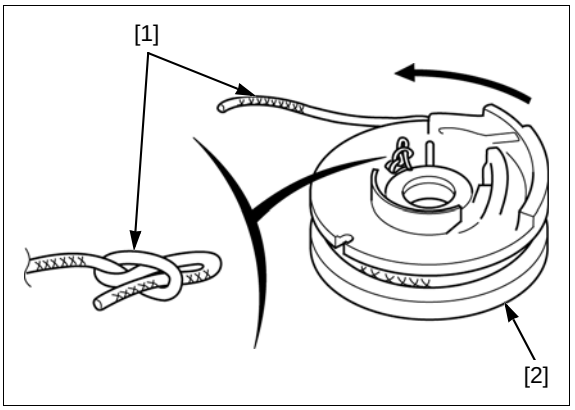
ASSEMBLY

Insert the hook on the outer side of the spring [1] into the groove [2] inside the starter reel [3]. Carefully wind the recoil starter spring [4] inside the starter reel.

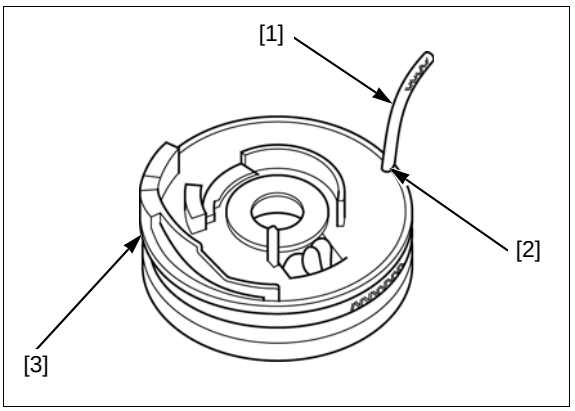


Pass the starter rope [1] through the starter reel [2] and tie the rope so that it can be untied easily by pulling it as shown.

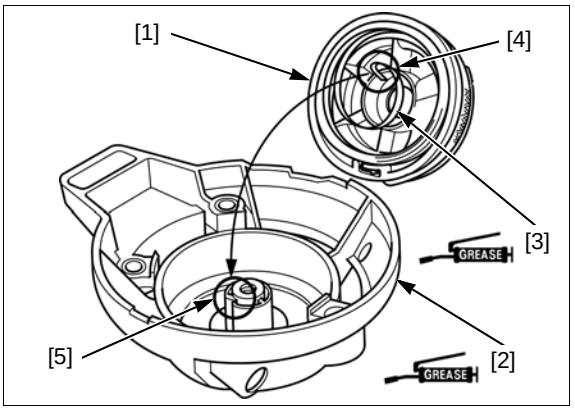
Wind the starter rope around the recoil starter reel in the direction of the arrow.



Position the end of the starter rope [1] at the cutout [2] in the starter reel [3].



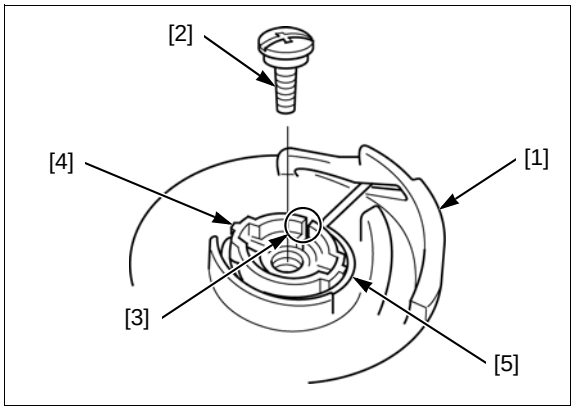
Install the starter reel [1] on the starter case [2] so that the spring [3] inner hook [4] is hooked to the case tab [5].



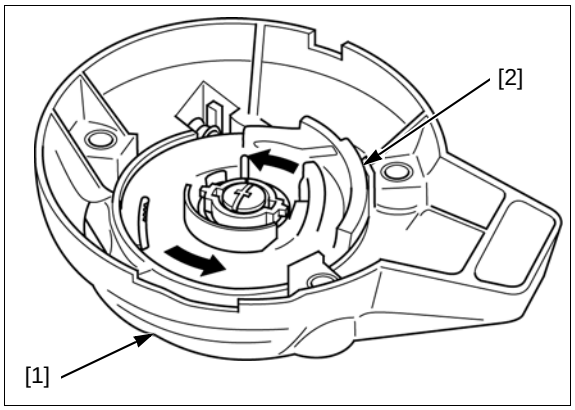
Secure the starter reel [1] with the set screw [2].

NOTICE

- *Make sure to align the groove [3] of the swing arm collar [4] with the swing arm [5].*



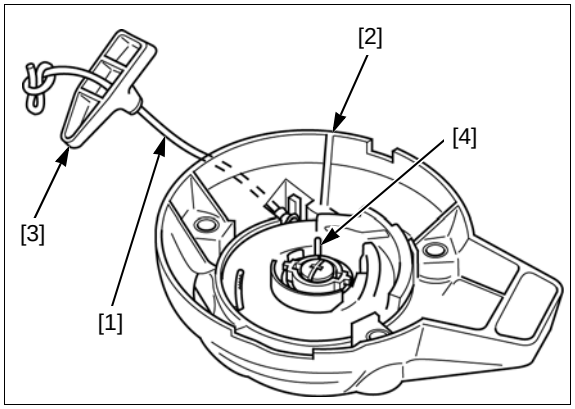
Hold the starter case [1] and rotate the starter reel [2] three turns in the direction of the arrow for preliminary winding.



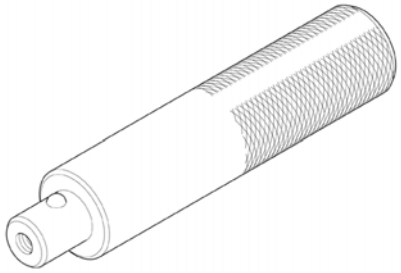
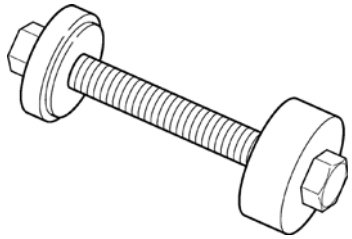
Pass the starter rope [1] end through the case [2] and pull it outwards.

Pass the starter rope through the starter grip [3] and tie the rope so that it can be untied easily by pulling it as shown.

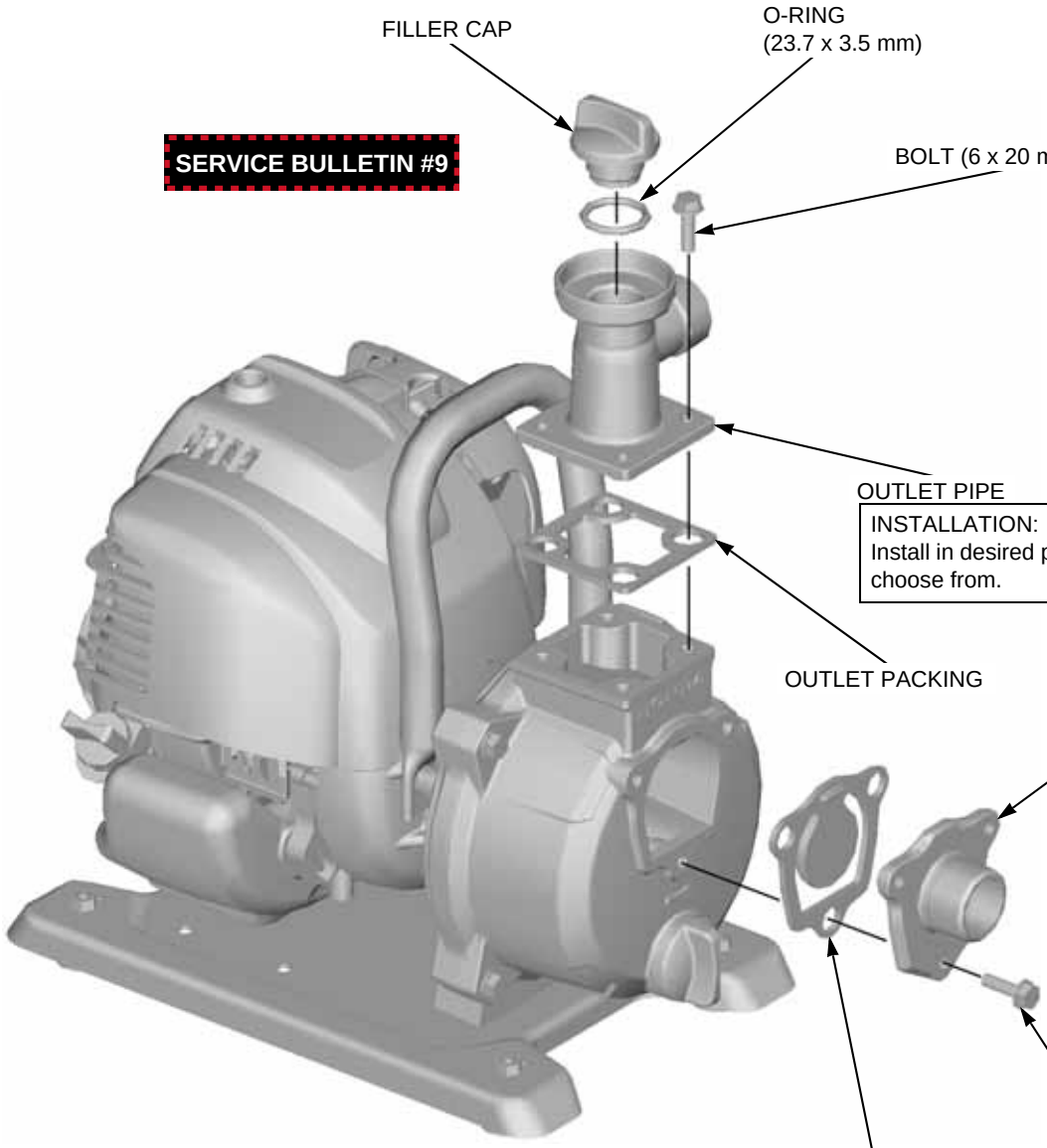
Pull the starter grip several time to make sure the swing arm [4] operates properly.



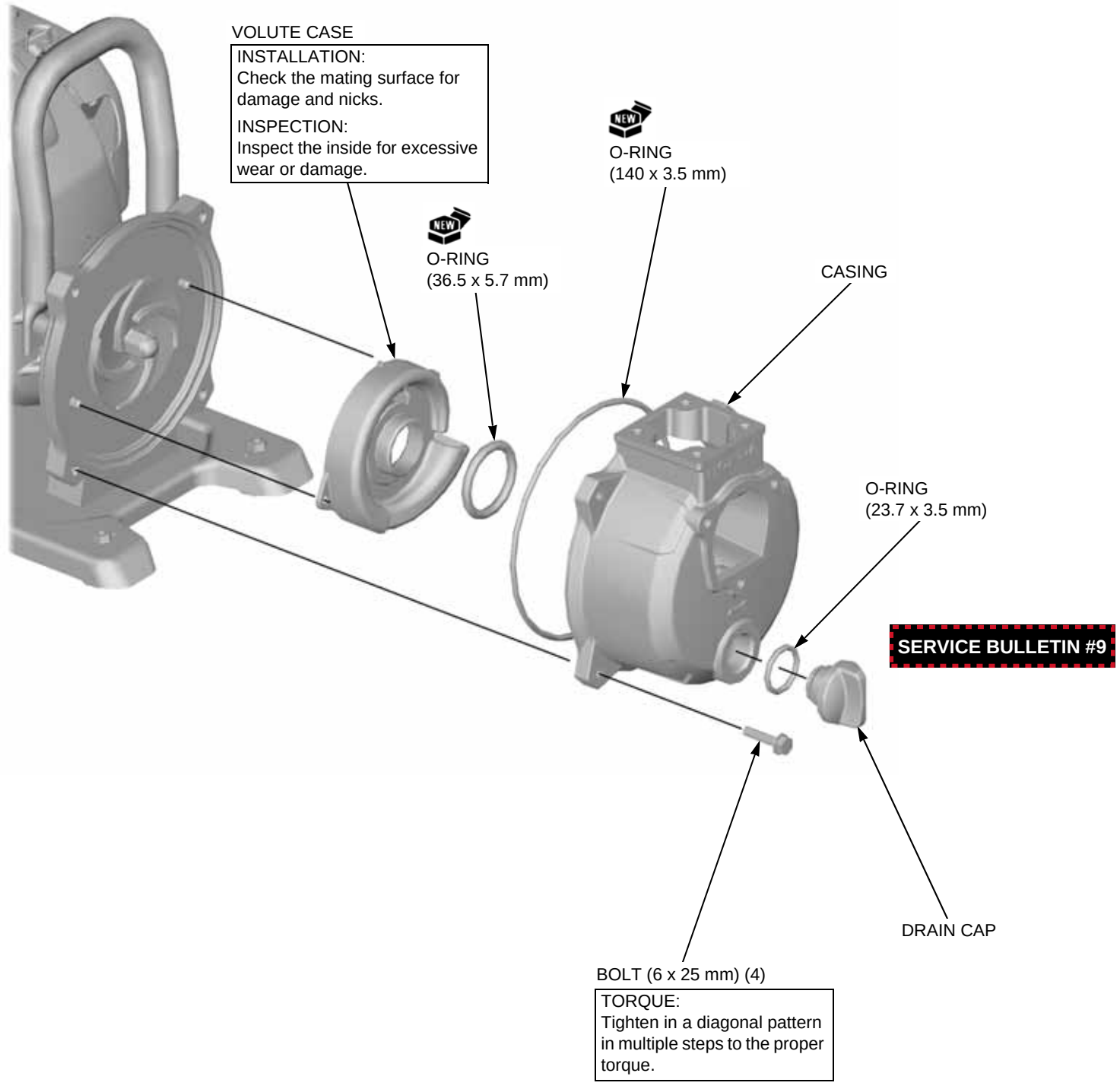
TOOLS

Attachment, 24 x 26 mm 07746-0010700 	Driver 07749-0010000 	Mechanical seal installer 07965-415000A 

INLET PIPE/OUTLET PIPE REMOVAL/INSTALLATION



CASING/VOLUTE CASE REMOVAL/INSTALLATION

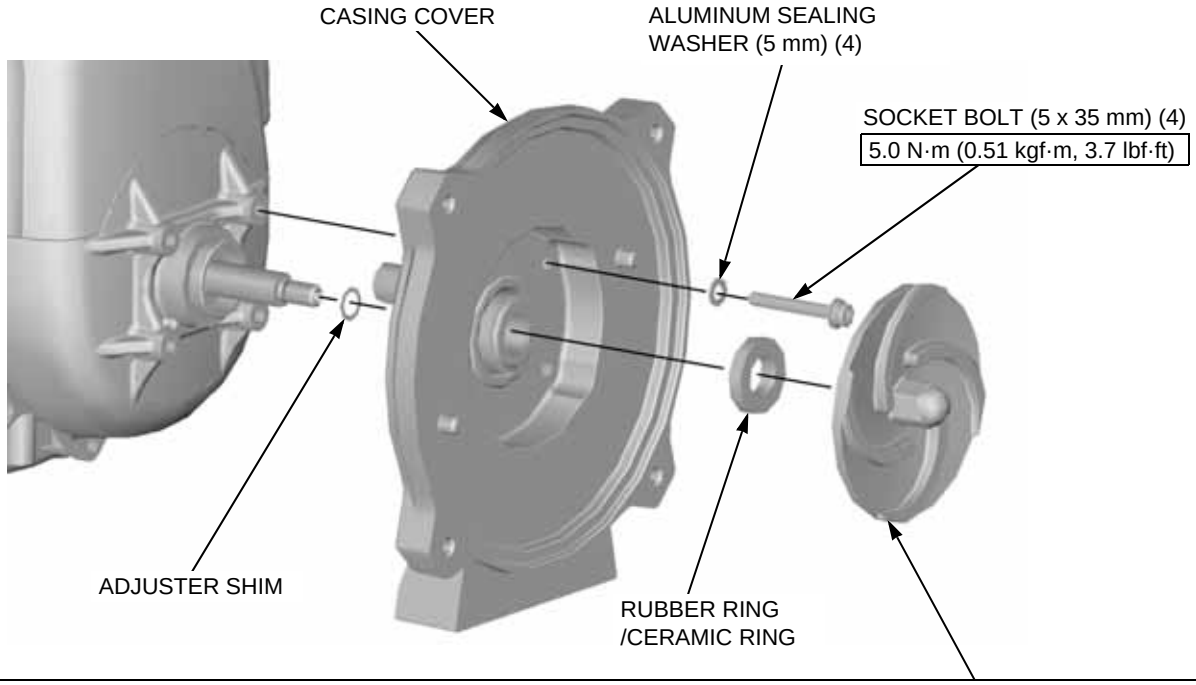


IMPELLER/CASING COVER REMOVAL/INSTALLATION

Remove the engine and pump from engine bed (page 11-2).

Remove the volute case (page 10-4).

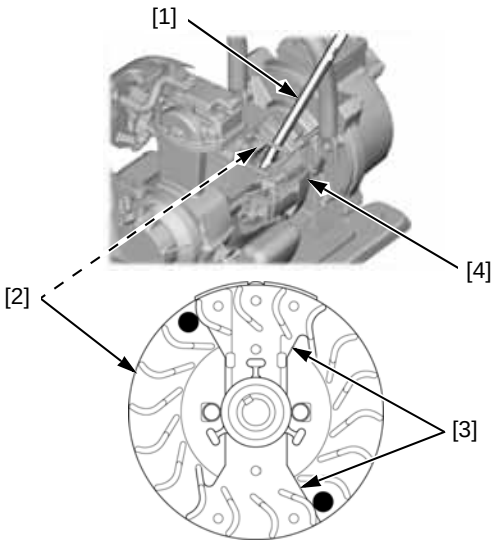
Remove the ignition coil (page 8-4).



REMOVAL:

Insert a rod of O.D. 8 - 10 mm (0.30 - 0.40 in) [1] between the flywheel [2] weight [3] and fan cover [4] and lock the flywheel as shown.

Holding flywheel locked, remove the impeller.



INSTALLATION:

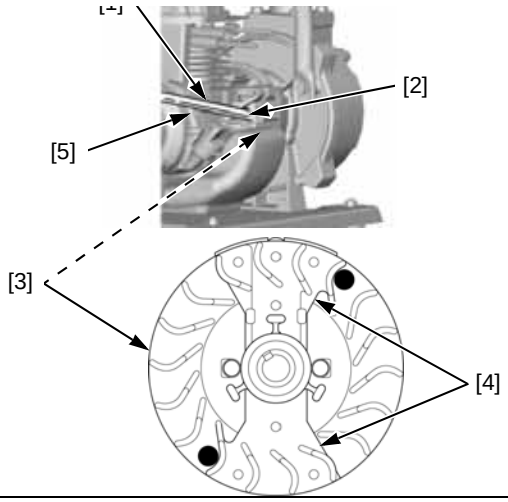
Insert a rod of O.D. 5 - 6 mm (0.20 - 0.24 in) [1] into the gap in the cylinder barrel [2], and lock the flywheel [3] by setting the rod on the flywheel weight [4] and on the projection [5] on the cylinder barrel as shown.

Holding flywheel locked, tighten the impeller to the specified torque.

6.9 N·m (0.70 kgf·m, 5.1 lbf·ft)

INSPECTION: Inspect the impeller vanes for excessive wear or damage. Replace if necessary.

After installation, check the impeller clearance: (page 3-11)

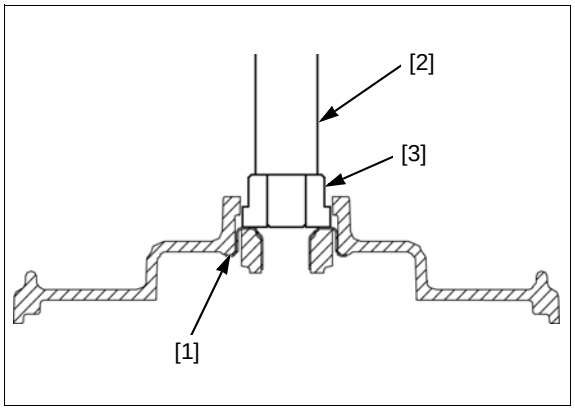


MECHANICAL SEAL REPLACEMENT

Drive out the mechanical seal [1] from the inside using the special tools.

TOOLS:

Driver handle [2]	**07749-0010000**
Attachment, 24 x 26 mm [3]	**07746-0010700**



Place the seal onto the seal driver [1] and bolt [2].

Put the bolt through the casing cover [3].

Install the back up plate [4] with the B side facing the casing cover and install the washer [5] and nut [6].

Tighten until the seal is fully seated.

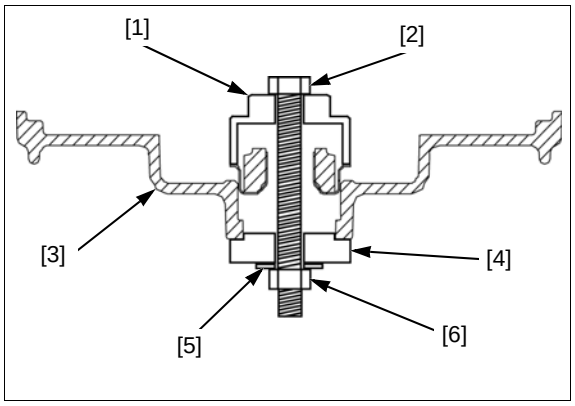
NOTICE

- *Be careful not to damage the sliding surface of the mechanical seal.*

TOOLS:

Mechanical seal installer	**07965-415000A**

After installing, check to be sure the seal is fully seated and is not tilted in the casing cover.

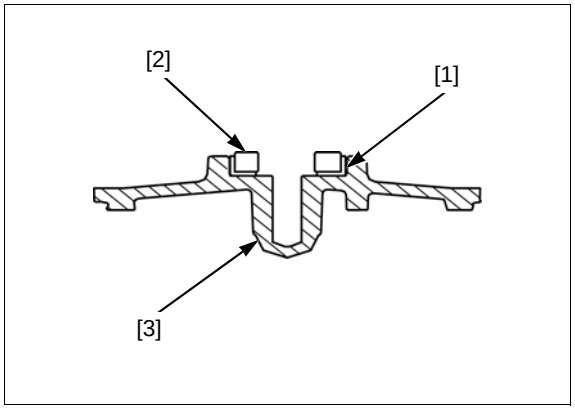


Install a new rubber ring [1] over a new ceramic ring [2].

NOTICE

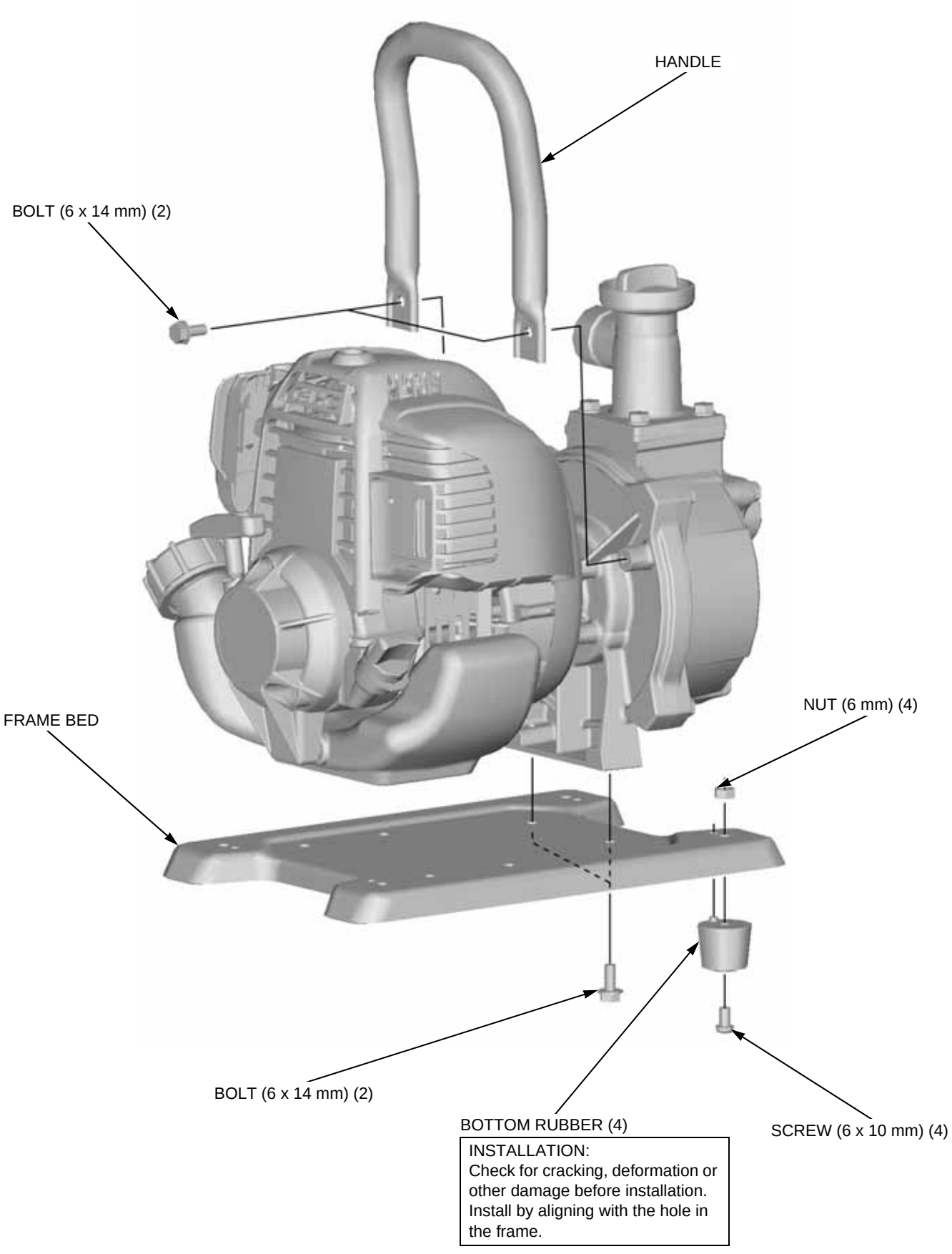
- *Be careful not to damage the sliding surface of the* ceramic ring.

Apply soapy water around the rubber ring. Install the rubber ring/ceramic ring assembly into the impeller [3] carefully with the rubber ring facing the impeller until it is fully seated.



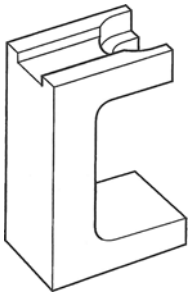
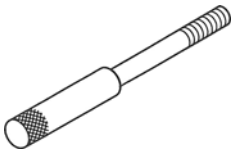
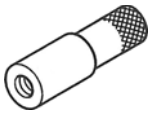
11. ENGINE REMOVAL/INSTALLATION

ENGINE REMOVAL/INSTALLATION



12. CRANKCASE

TOOLS

Piston base 07VPF-ZM3010B 	Push rod 07VPF-ZM3020A 	Guide 07VPF-ZM3030A 

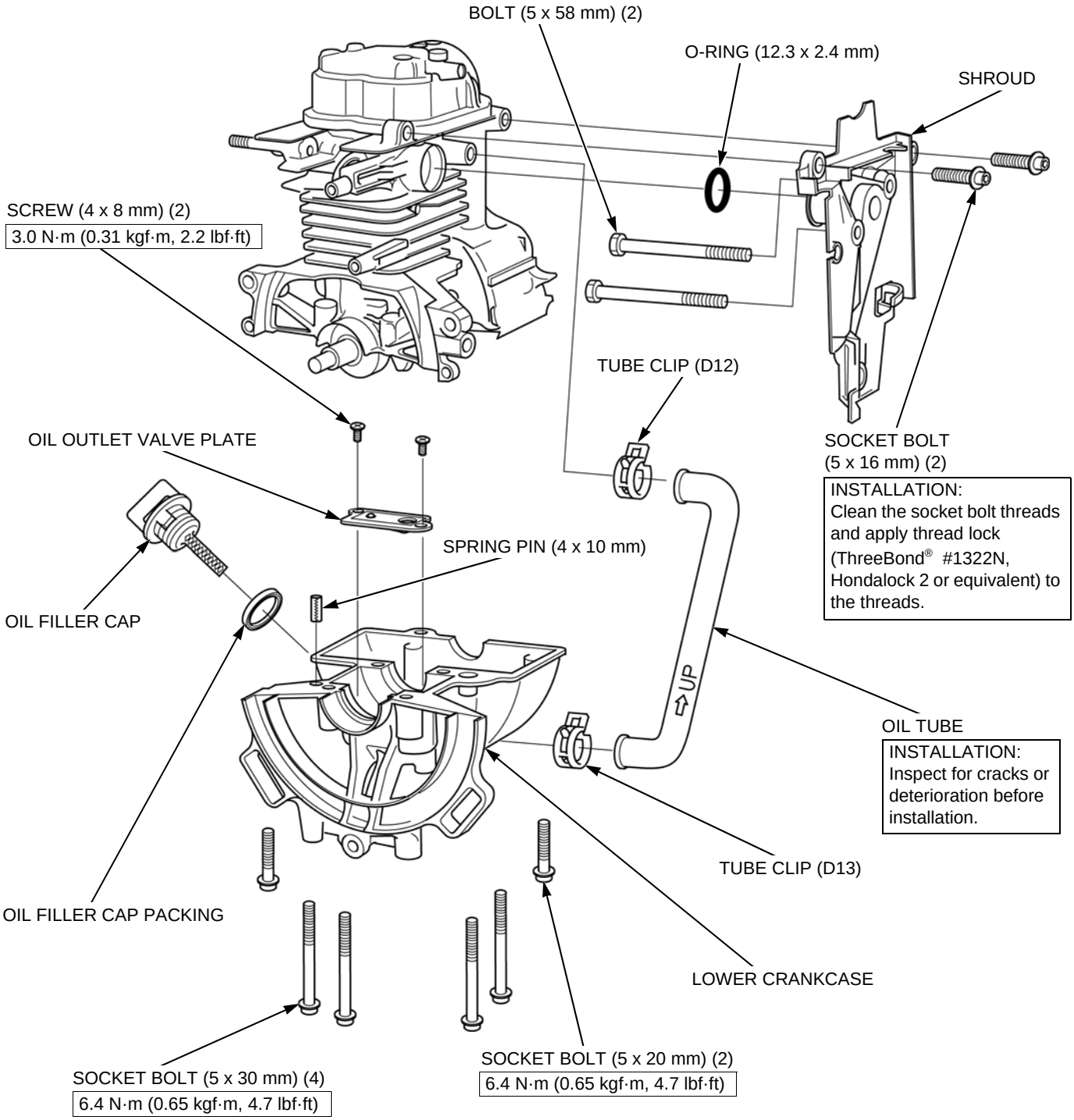
LOWER CRANKCASE/SHROUD REMOVAL/INSTALLATION

Drain the engine oil (page 3-4).

Remove the engine (page 11-2).

Remove the following:

- Control base (page 7-2)
- Carburetor (page 6-4)
- Fuel tank (page 6-2)
- Muffler (page 14-2)
- Flywheel (page 8-6)
- Starter pulley (page 9-3)

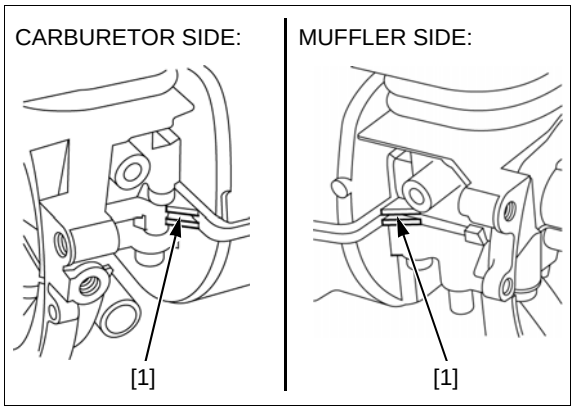


LOWER CRANKCASE REMOVAL/INSTALLATION

REMOVAL

Remove the two socket bolts (5 x 20 mm) and four socket bolts (5 x 30 mm).

Insert the screw driver or equivalent tool into the recess [1] as shown, and remove the lower crankcase from the cylinder barrel.



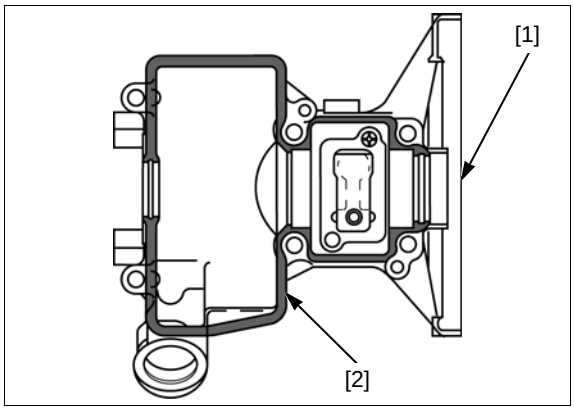
INSTALLATION

Clean the inside of the crankcase and remove foreign material.

Clean the mating surfaces of the cylinder barrel and the lower crankcase [1] using a degreasing cleaning agent and clean shop towel.

Apply a bead [2] [Φ1.0 – 1.5 mm (Φ0.04 – 0.06 in)] of the liquid sealant (ThreeBond® 1216E, Hondabond HT or equivalent) to the mating surface with the lower crankcase.

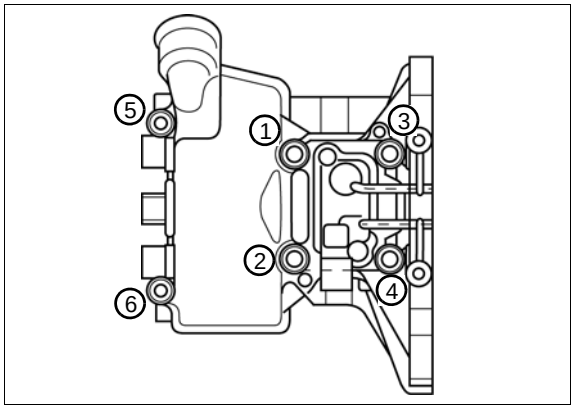
Install the lower crankcase on the cylinder barrel.
Assemble within 3 minutes after applying the liquid gasket.



Loosely tighten each two socket bolts (5 x 20 mm) and four socket bolts (5 x 30 mm) then tighten to the numbered sequence.

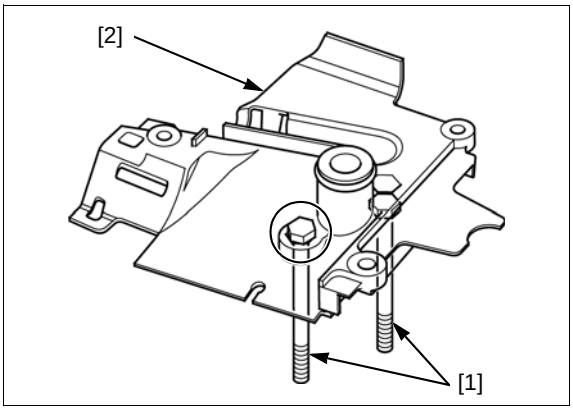
TORQUE: 6.4 N·m (0.65 kgf·m, 4.7 lbf·ft)

Wait for approximately 60 minutes after assembly before filling oil and starting the engine.



SHROUD INSTALLATION

Set the two bolts (5 x 58 mm) [1] on the shroud [2]. Take care not to allow the bolt heads to protrude from the shroud when installing on the cylinder barrel.

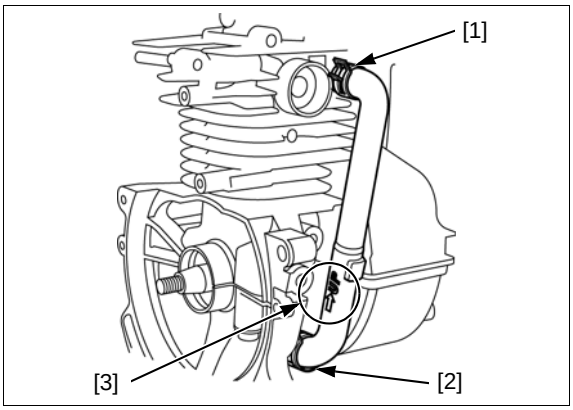


OIL TUBE INSTALLATION

Install the oil tube and the tube clamp (D12) [1] and tube clamp (D13) [2] with the " ⇨UP" mark [3] of the oil tube facing toward the cylinder.

NOTICE

- *Do not interchange the clamps.*
- *Be sure that the tube and the shroud do not come into contact.*



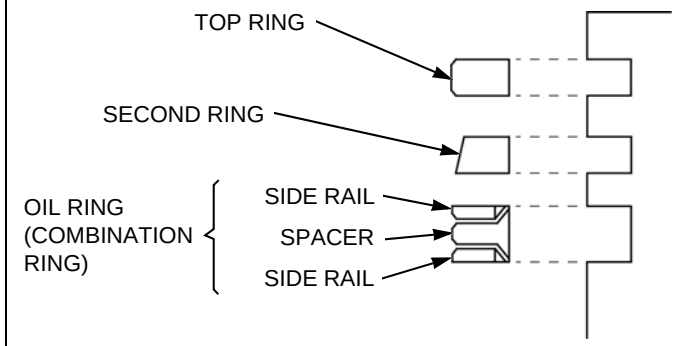
CRANKSHAFT/PISTON REMOVAL/INSTALLATION

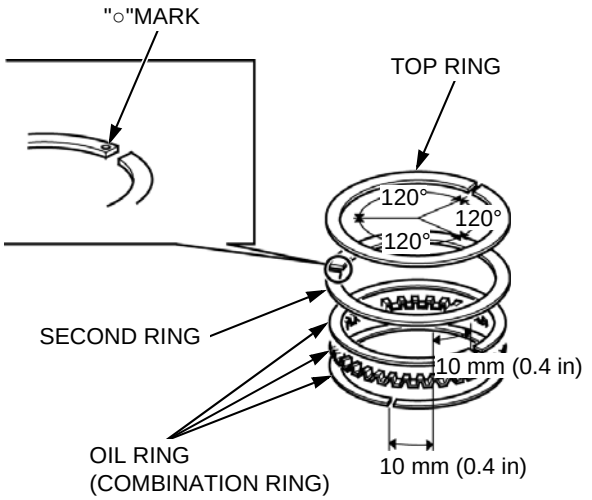
Remove the lower crankcase (page 12-3).

Remove the cam pulley (page 13-4).

PISTON RING

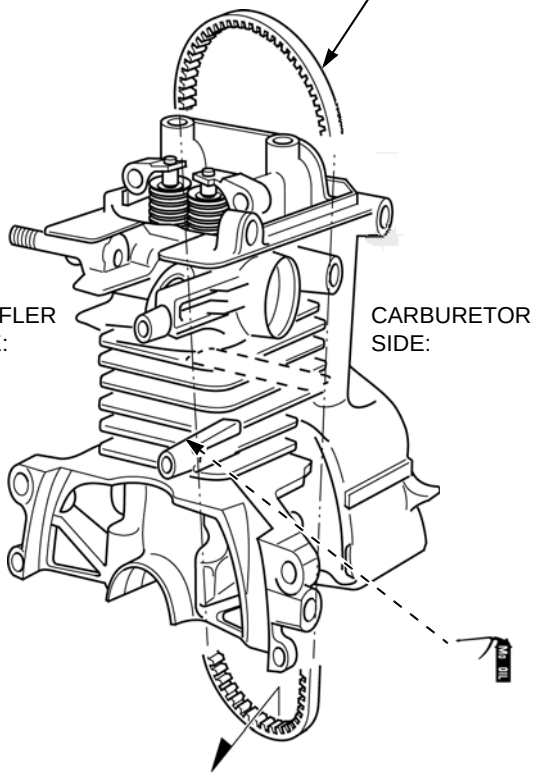
INSTALLATION:
·Install the top ring and second ring with the"○"mark facing up.
·Do not interchange the top ring and the second ring.
·After assembly, check for smooth movement of the piston ring.
·Stagger the piston ring end gaps 120° apart. Do not align with the piston pin.
·Space the side rail end gaps at least 10 mm (0.4 in) apart. Coat the oil ring with oil after assembly.

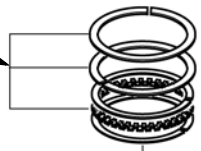




TIMING BELT

INSTALLATION:
Check that the belt is not worn or cracked. Do not bend or twist the belt.

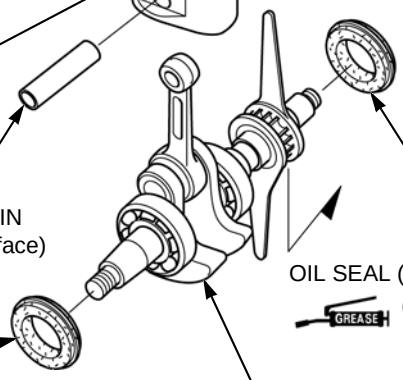




PISTON (Outer surface)

INSTALLATION:
Install with the "△" on the piston head facing the carburetor side.

PISTON PIN (Outer surface)

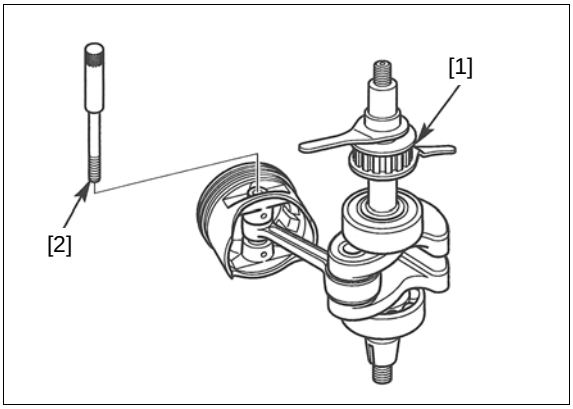


PISTON PIN
REMOVAL/ INSTALLATION

REMOVAL

Insert the special tool (push rod) into the piston pin with the crankshaft timing belt drive pulley [1] upward as shown.

TOOL:
Push rod [2] **07VPF-ZM3020A**

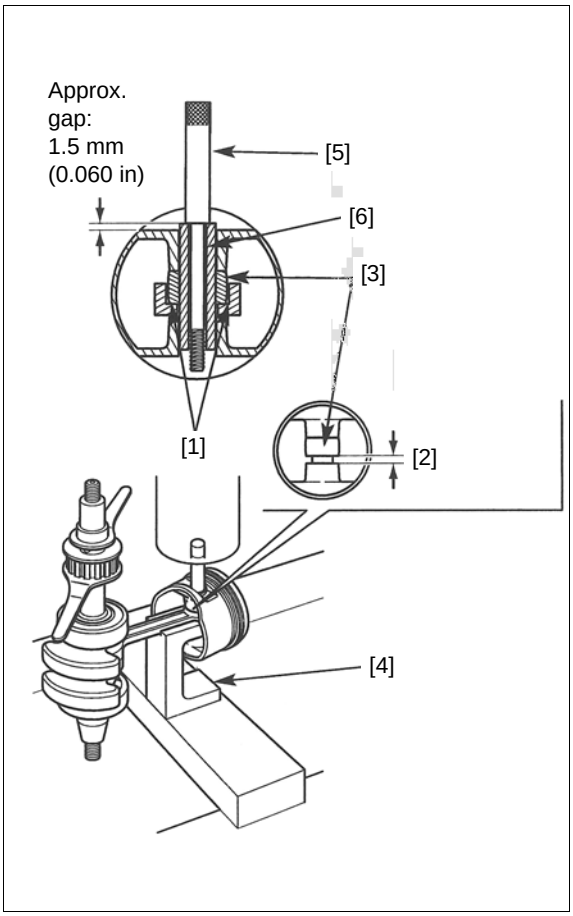


Set the cutout part [1] of the special tool (piston base) in the clearance [2] between the connecting rod [3] and the piston as shown.

- Be sure that the connecting rod small end is securely set in the cutout of the special tool (piston base).

TOOL:
Piston base [4] **07VPF-ZM3010B**
Push rod [5] **07VPF-ZM3020A**

Remove the piston pin [6] from the connecting rod using a hydraulic press.

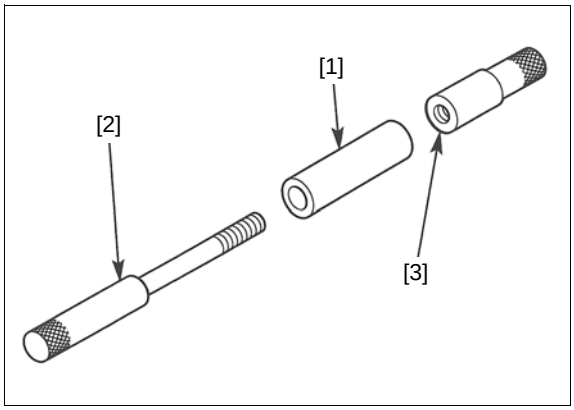


INSTALLATION

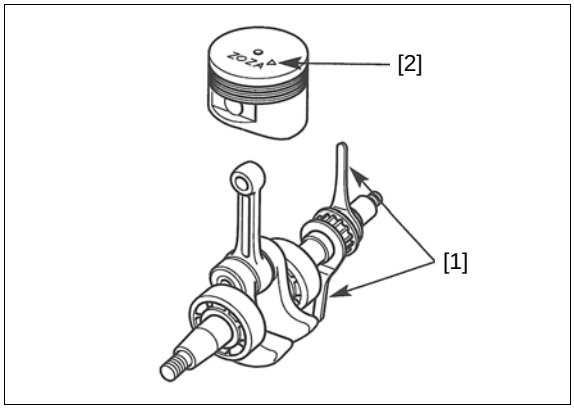
Slide the piston pin [1] over the special tool (push rod) and install the special tool (guide).

TOOL:

Push rod [2]	**07VPF-ZM3020A**
Guide [3]	**07VPF-ZM3030A**



Set the piston over the connecting rod so that the crankshaft oil slinger [1] comes at the right side with the " △ " mark [2] on the piston head toward you as shown.



Apply oil to the piston pin [1] and assemble the piston pin with special tools attached as shown.

With the timing belt drive pulley [2] up, align the piston pin hole with the connecting rod [3] hole and insert the special tool (guide) into the piston pin hole.

Set the cutout part [4] of the special tool (piston base) in the clearance between the connecting rod and the piston as shown.

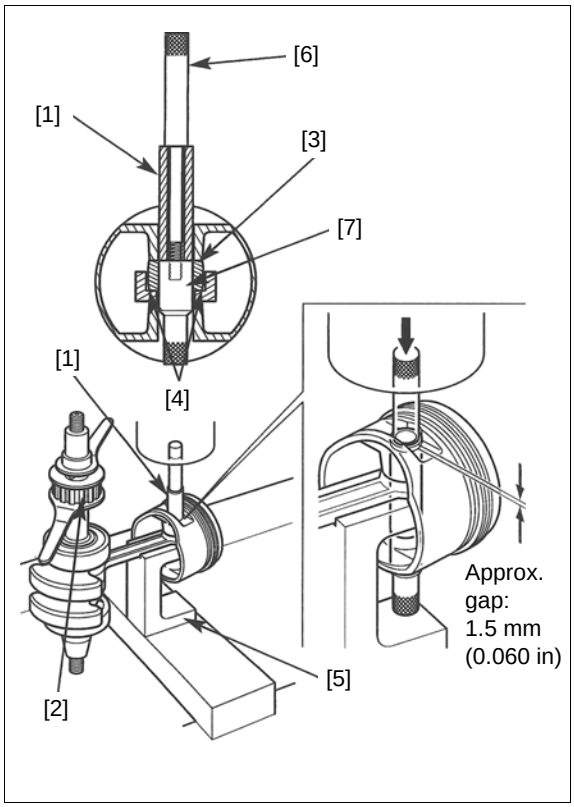
- Be sure that the connecting rod small end is securely set in the cutout of the special tool (piston base).

TOOL:

Piston base [5]	**07VPF-ZM3010B**
Push rod [6]	**07VPF-ZM3020A**
Guide [7]	**07VPF-ZM3030A**

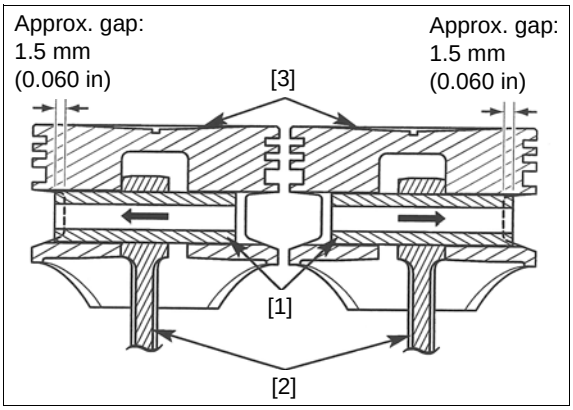
Using a hydraulic press to press the piston pin into the connecting rod until the piston pin extends approximately 1.5 mm (0.060 in) above the piston pin.

Remove the special tools from the piston pin.



After assembling the piston pin [1], move the connecting rod [2] from side-to-side and make sure the gap from the piston pin end to the piston [3] end is equal at the right and left sides.

If the right and left gaps are not equal, raise or lower piston pin as needed.



CRANKSHAFT INSTALLATION

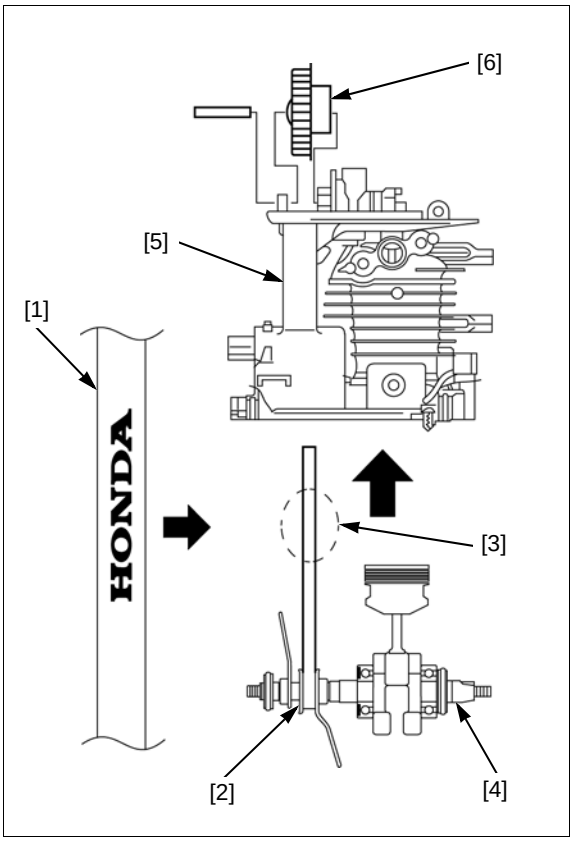
Install the timing belt [1] on the timing gear [2] of the crankshaft. When installing, pay attention to the direction of the letter [3] on the timing belt as shown in the picture.

- Replace worn or cracked timing belt. Do not bend or twist the timing belt.

Install the crankshaft [4] in the cylinder barrel [5].

Apply a bead of Hondabond HT liquid gasket to the cylinder barrel (page 12-4) specifically to the mating surface of the lower crankcase. Install the lower crankcase on the cylinder barrel.

Install the cam pulley [6] and timing belt in the cylinder barrel (page 13-4).



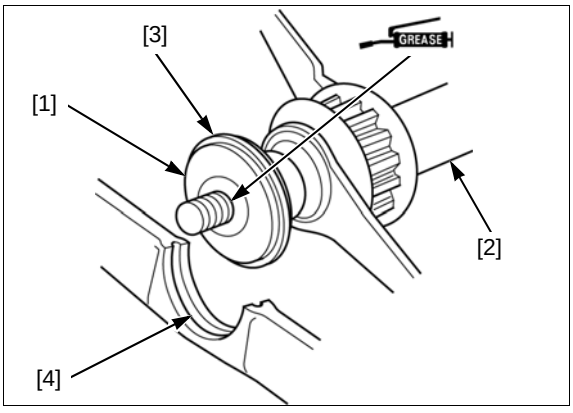
CRANKSHAFT OIL SEAL (10 x 20 x 5 mm/12 x 24 x 5 mm) INSTALLATION

Apply grease to the lip of the oil seal [1].

Set the oil seal on the crankshaft [2].

Install crankshaft by aligning the oil seal projection [3] with the groove [4] in the cylinder barrel.

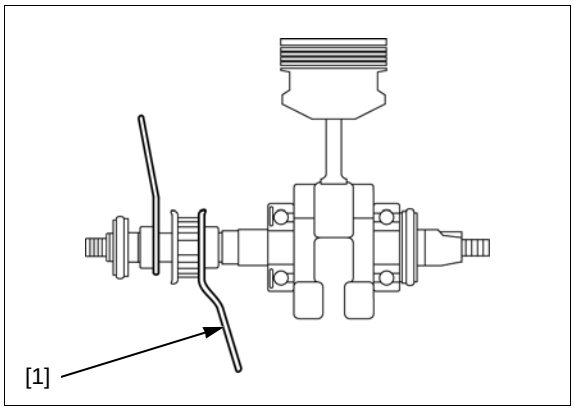
Install the lower crankcase (page 12-4).



CRANKSHAFT/PISTON INSPECTION

OIL SLINGER

Check the oil slinger [1] of the crankshaft for damage and deformation. Replace the crankshaft if it is damaged or deformed.

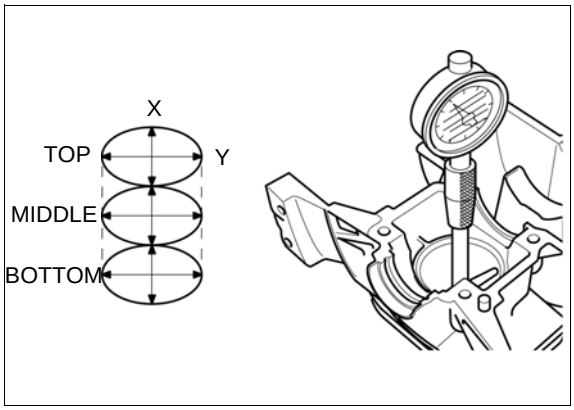


CYLINDER SLEEVE I.D.

Measure and record the cylinder I.D. at three levels in both the "X" axis (perpendicular to crankshaft) and the "Y" axis (parallel to crankshaft). Take the maximum reading to determine cylinder wear and taper.

STANDARD: **35.000 – 35.015 mm (1.3780 – 1.3785 in)**
SERVICE LIMIT: **35.100 mm (1.3819 in)**

If the measurement is more than the service limit, replace the crankcase set, piston, and rings.

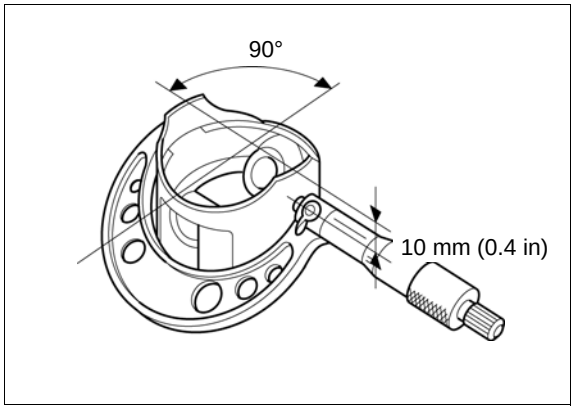


PISTON SKIRT O.D.

Measure and record the piston O.D. at a point 10 mm (0.4 in) from the bottom of the skirt and 90 degrees to the piston pin bore.

STANDARD: **34.970 – 34.990 mm (1.3768 – 1.3776 in)**
SERVICE LIMIT: **34.900 mm (1.3740 in)**

If the measurement is less than the service limit, replace the piston and rings. Do not hone the cylinder.



PISTON-TO-CYLINDER CLEARANCE

Subtract the piston skirt O.D. from the cylinder sleeve I.D. to obtain the piston-to-cylinder clearance.

STANDARD: **0.010 – 0.045 mm (0.0004 – 0.0018 in)**
SERVICE LIMIT: **0.120 mm (0.0047 in)**

If the calculated clearance is more than the service limit, replace the piston and recheck the clearance.

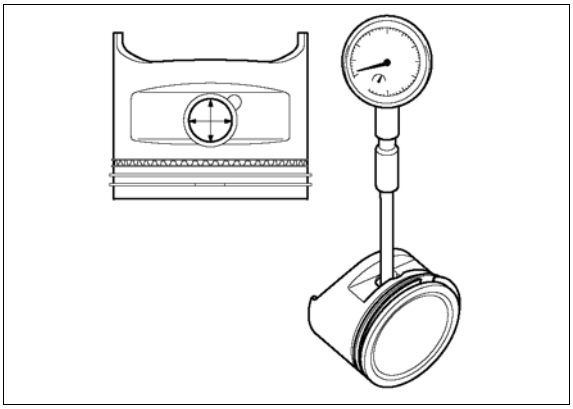
If the clearance is still more than the service limit with the new piston, replace the crankcase set. Do not hone the cylinder.

PISTON PIN BORE I.D.

Measure and record the piston pin bore I.D. of the piston.

STANDARD: **8.010 – 8.026 mm (0.3154 – 0.3160 in)**
SERVICE LIMIT: **8.060 mm (0.3173 in)**

If the measurement is more than the service limit, replace the piston.

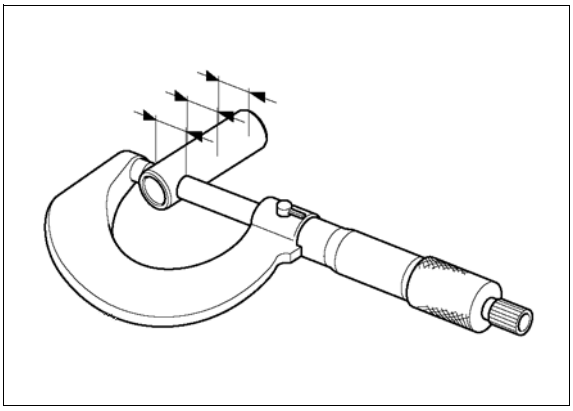


PISTON PIN O.D.

Measure and record the piston pin O.D. at three points (both ends and middle). Take the minimum reading to determine piston pin O.D.

STANDARD: **7.994 – 8.000 mm (0.3147 – 0.3150 in)**
SERVICE LIMIT: **7.950 mm (0.3130 in)**

If the measurement is less than the service limit, replace the piston pin.



PISTON PIN-TO-PISTON PIN BORE CLEARANCE

Subtract the piston pin O.D. from the piston pin bore I.D. to obtain the piston pin-to-piston pin bore clearance.

STANDARD: **0.010 – 0.032 mm (0.0004 – 0.0013 in)**
SERVICE LIMIT: **0.070 mm (0.0028 in)**

If the calculated clearance is more than the service limit, replace the piston pin and recheck the clearance.

If the clearance is still more than the service limit with the new piston pin, replace the piston.

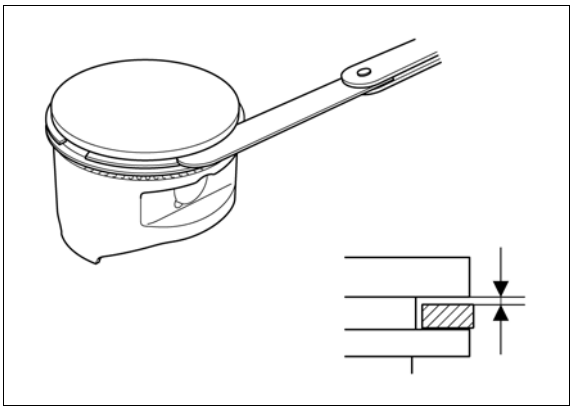
PISTON RING SIDE CLEARANCE

Measure the clearance between each piston ring and ring groove of the piston using feeler gauge.

STANDARD:
Top/Second: **0.015 – 0.056 mm (0.0006 – 0.0022 in)**
SERVICE LIMIT:
Top/Second: **0.120 mm (0.0047 in)**

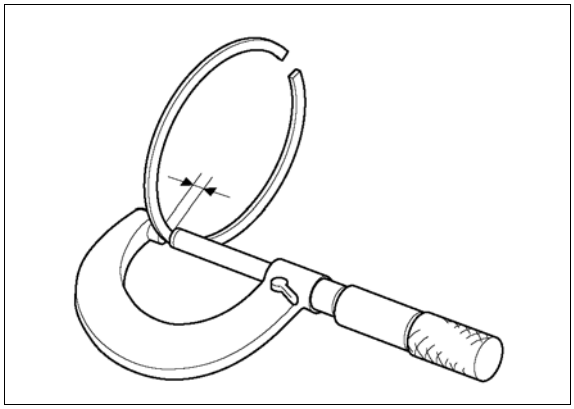
If the calculated clearance is more than the service limit, replace the piston rings (top, second, oil) as a set and recheck the clearance.

If the clearance is still more than the service limit with the new piston ring, replace the piston.



PISTON RING WIDTH

Measure each piston ring width.



STANDARD:
Top/Second: 0.970 – 0.990 mm (0.0382 – 0.0390 in)
SERVICE LIMIT:
Top/Second: 0.920 mm (0.0362 in)

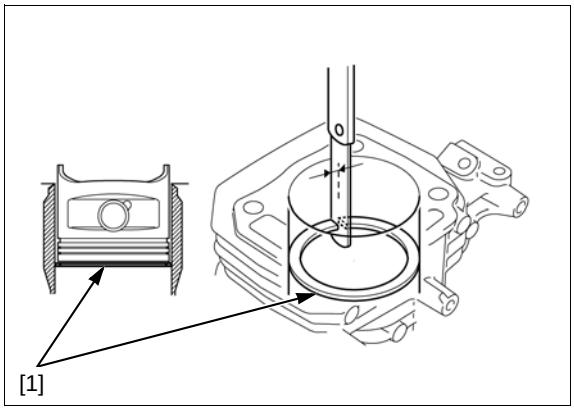
If any of the measurements is less than the service limit, replace the piston rings (top, second, oil) as a set.

Do not hone the cylinder.

PISTON RING END GAP

Before inspection, check whether the cylinder sleeve I.D. is within the specification (page 12-10).

Put the piston ring in the cylinder and then use the piston crown to push the ring down.
This will make the piston ring horizontal so ring end gap can be measured.



Measure each piston ring [1] end gap using a feeler gauge.

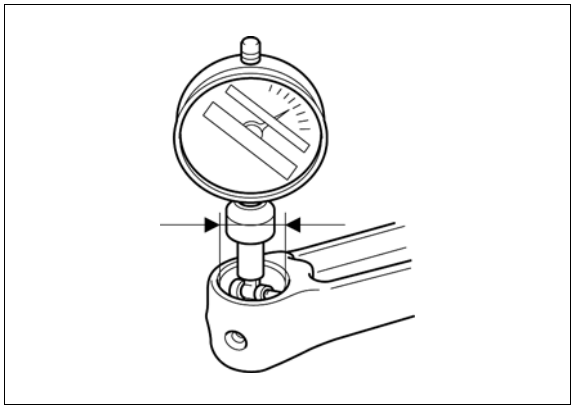
STANDARD:
Top/Second: 0.10 – 0.25 mm (0.004 – 0.010 in)
SERVICE LIMIT:
Top/Second: 0.60 mm (0.024 in)

If any of the measurements is more than the service limit, replace the piston rings (top, second, oil) as a set.

Do not hone the cylinder.

CONNECTING ROD SMALL END I.D.

Measure the connecting rod small end I.D.



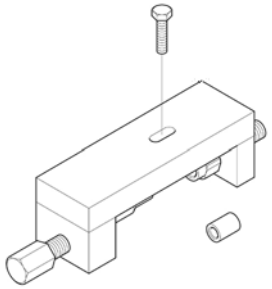
STANDARD: 7.978 – 7.989 mm (0.3141 – 0.3145 in)
SERVICE LIMIT: Replace if exceeding the standard value.

If the measurement is more than the service limit, replace the crankshaft.

13. CYLINDER HEAD

TOOL

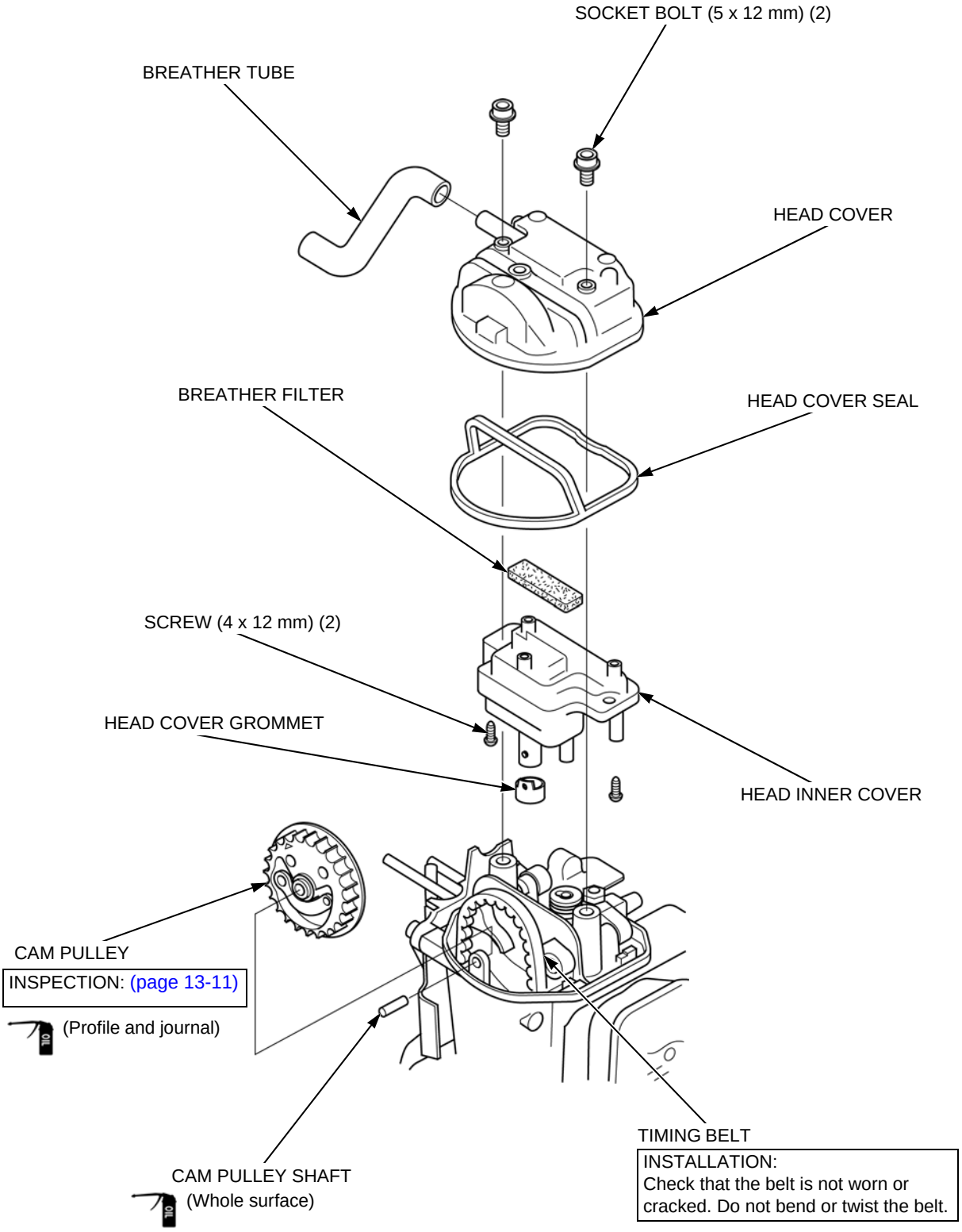
Rocker arm replacement tool
070PF-Z0HA100



CYLINDER HEAD COVER/CAM PULLEY REMOVAL/INSTALLATION

Remove the following:

- Spark plug (page 3-6)
- Top cover (page 5-2)
- Fan cover (page 8-5)



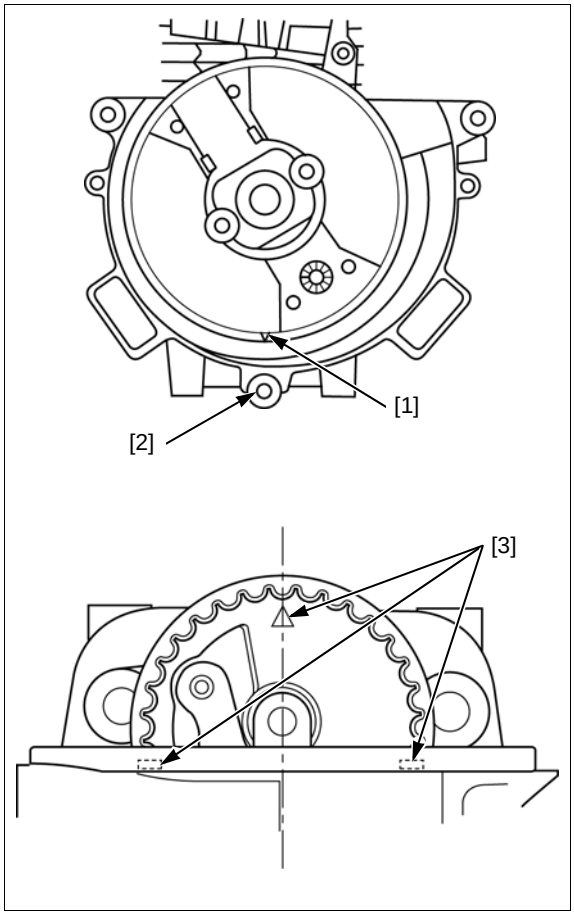
CAM PULLEY
REMOVAL/ INSTALLATION

Remove the following:

– Spark plug (page 3-6)
– Head cover (page 13-3)
– Fan cover (page 8-5)

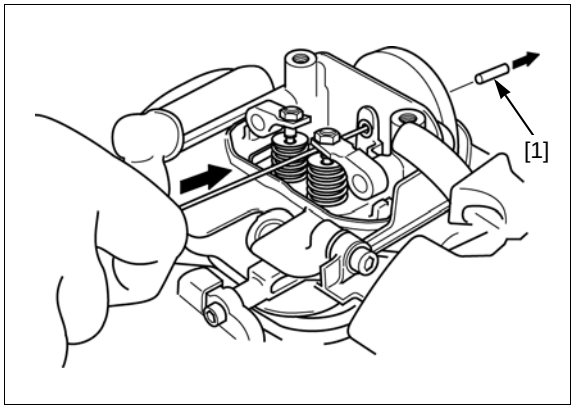
Set the piston at top dead center (TDC) of the compression stroke.

When the piston is at TDC of the compression stroke, the flywheel " ▽ " mark [1] will align with the fan cover bolt hole [2]. Also, the cam pulley alignment marks [3] will be positioned as shown.



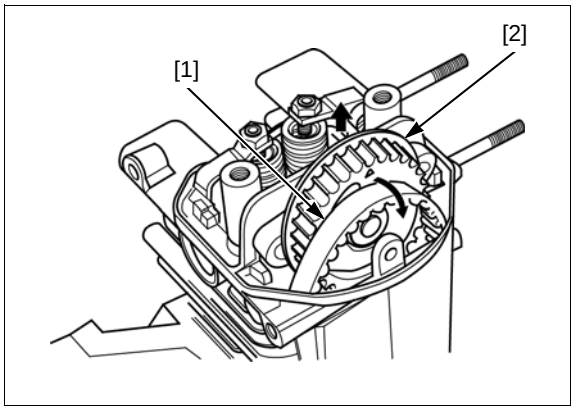
Push the cam pulley shaft [1] out from the valve spring side using a pin approximately 2 mm in diameter.

• Be careful not to let the cam pulley shaft fall into the crankcase.



Remove the timing belt [1] from the cam pulley [2], and remove the cam pulley.

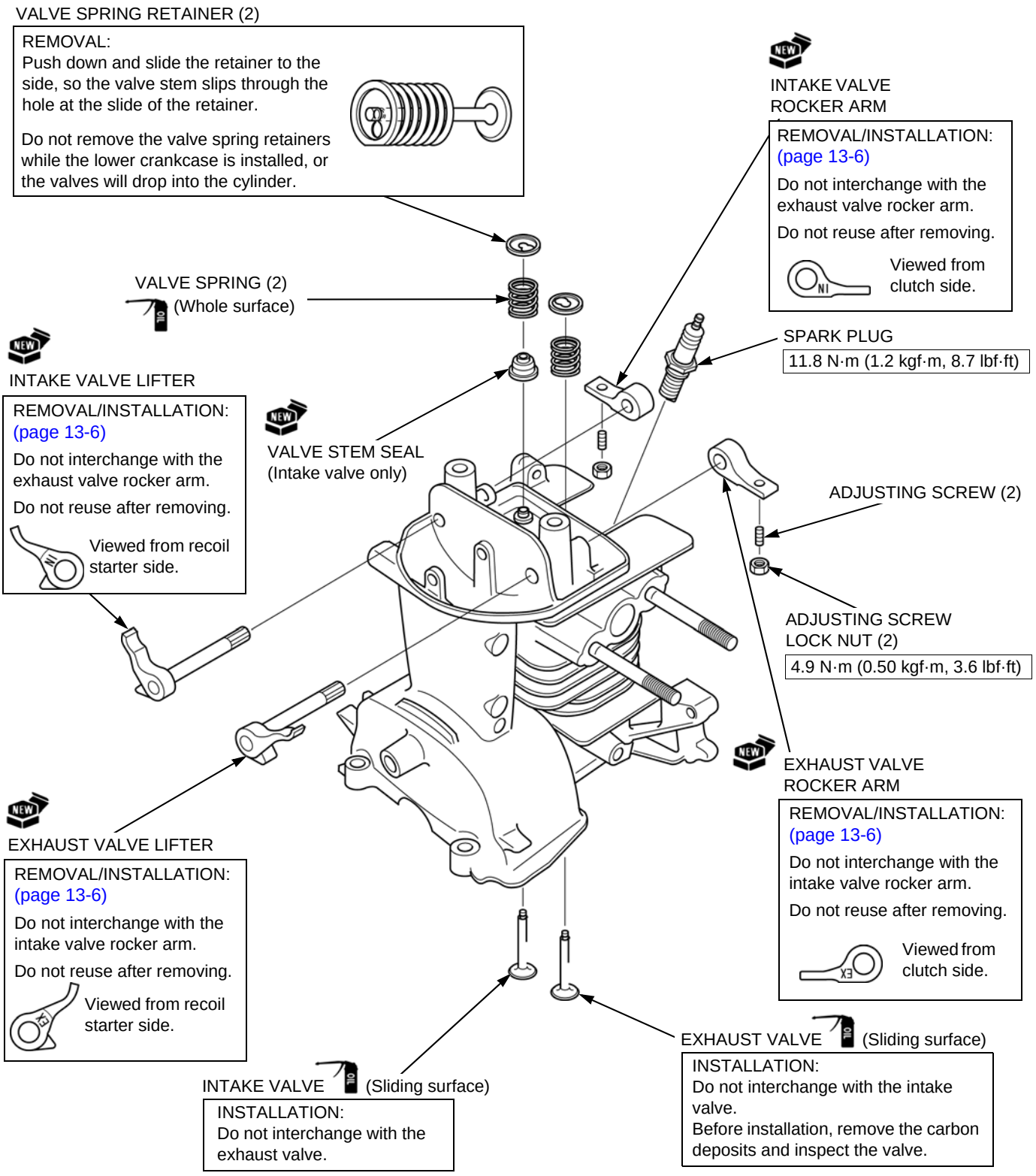
Installation is in the reverse order of removal. Make sure the alignment marks on the cam pulley and the flywheel are aligned.



ROCKER ARM/VALVES REMOVAL/INSTALLATION

Remove the cam pulley (page 13-3).

Remove the crankshaft (page 12-6).

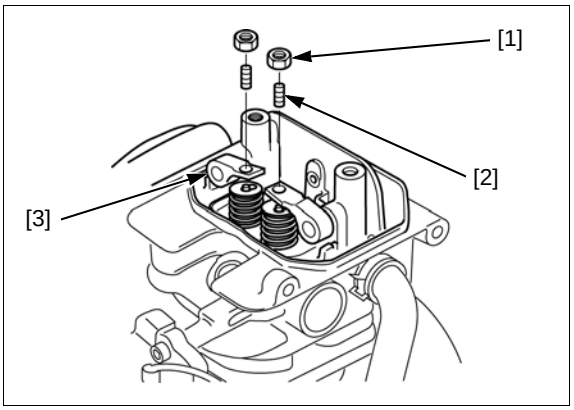


ROCKER ARM/VALVE LIFTER REMOVAL/INSTALLATION

REMOVAL

Remove the adjusting screw lock nuts [1] and remove the adjusting screws [2] from the rocker arms [3].

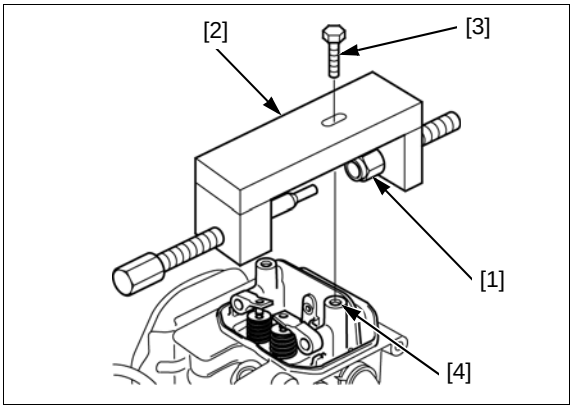
Remove the cam pulley (page 13-4).



Tighten the holder bolt [1] of the special tool fully as shown.

TOOL:
Rocker arm replacement tool [2] 070PF-Z0HA100

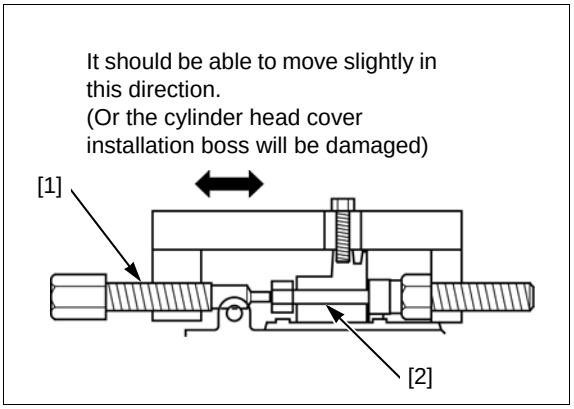
Set the special tool on the cylinder head over the rocker arm and valve lifter that you are going to take apart, and tighten the bolt (5 mm) [3] to the cylinder head cover installation boss [4] by hand.



NOTICE

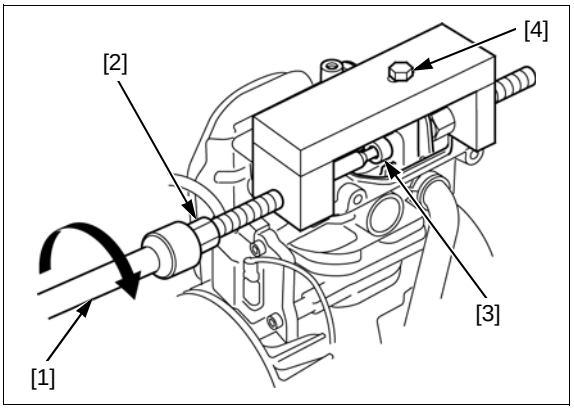
Do not tighten the bolt (5 mm) using a wrench.

Tighten the push rod [1] of the special tool by hand until the tip of the push rod comes to the center of the valve lifter shaft [2]. Move the special tool left and right and check that it can be moved slightly.



Using a 14 mm wrench [1], tighten the push rod [2] until the shaft of the valve lifter goes out from the rocker arm [3].

Loosen the push rod and remove the bolt (5 mm) [4], and then remove the special tool.



NOTICE

The valve lifters and rocker arms cannot be reused after they are pressed apart. Always replace with new parts.

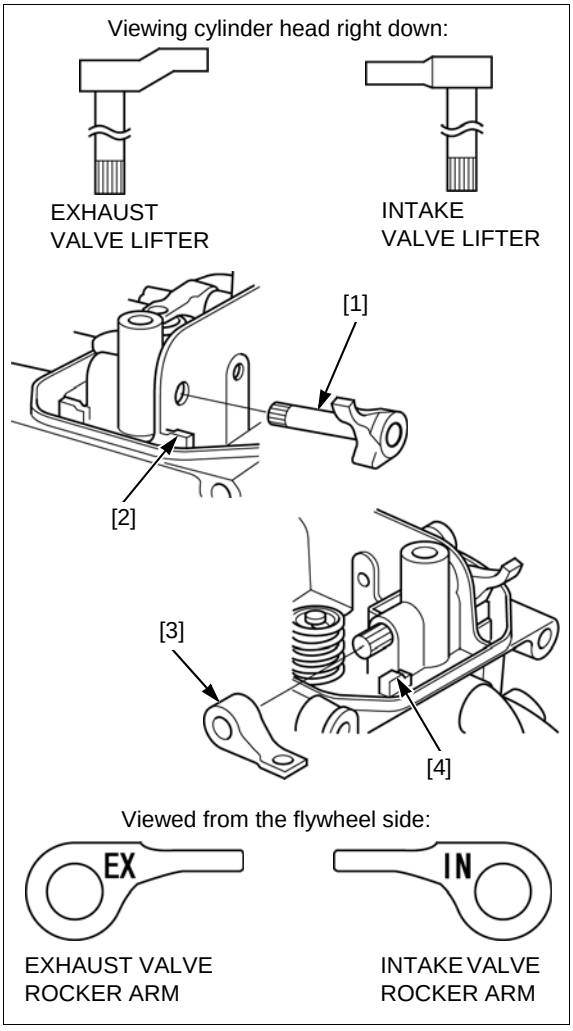
INSTALLATION

Install the new valve lifter [1] on the cylinder head and bring the valve lifter in contact with the installation guide rib [2] of the cylinder head.

Push the new rocker arm [3] into the shaft of the valve lifter by hand while holding the valve lifter in the position and holding the rocker arm against the installation guide rib [4] of the cylinder head.

NOTICE

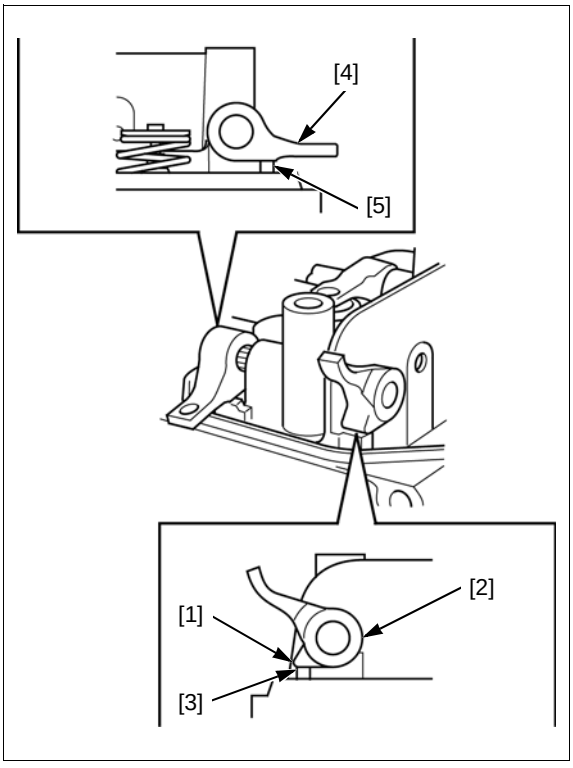
- *Check the valve lifter for inlet side and exhaust side before installation. Do not interchange them.*
- *Check the rocker arm for "IN" or "EX" marks before installation. Do not interchange them.*



Set the projection [1] of the valve lifter [2] in contact with the installation guide rib [3] of the cylinder head.

Set the rocker arm [4] in contact with the installation guide rib [5] of the cylinder head.

Check that the projection on the valve lifter and the rocker arm are in contact with the installation guide rib of the cylinder head.



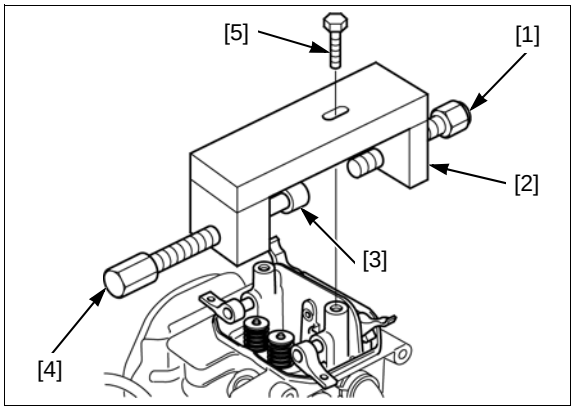
Install the holder bolt [1] of the special tool in the direction as shown.

TOOL:
Rocker arm replacement tool [2] 070PF-Z0HA100

Install the adapter [3] on the tip of the push rod [4] that is set on the special tool.

Install the special tool on the cylinder head so that the bolt (5 mm) [5] sets in the center of the long hole in the special tool as shown.

Tighten the bolt (5 mm) against the cylinder head cover mounting boss by hand.



NOTICE

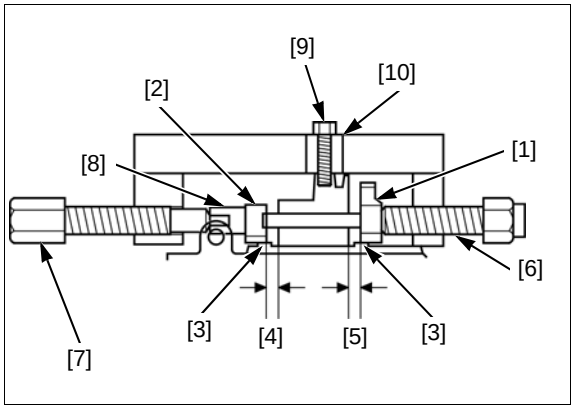
- *Set the bolt (5 mm) in the center of the long hole.*
- *Do not tighten the bolt (5 mm) using a wrench.*

Bring the projection on the valve lifter [1] and the rocker arm [2] to come in contact with the cylinder head positioning ribs [3].

Bring the clearance A [4] and B [5] to be equal by moving the valve lifter and rocker arm right and left.

While holding the valve lifter and rocker arm in the position, tighten the holder bolt [6] by hand until it contacts the valve lifter. Tighten the push rod [7] by hand until the adapter [8] contacts the rocker arm.

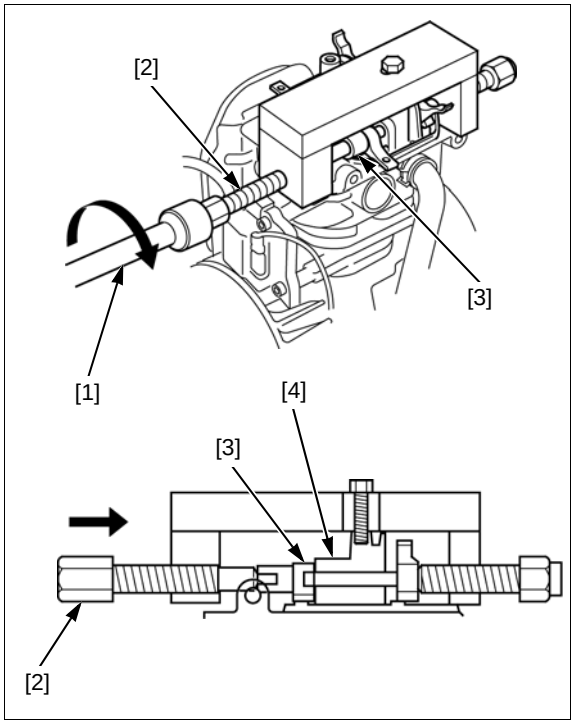
After installing the special tool, check that the bolt (5 mm) [9] is in the center of the long hole [10] in the tool.



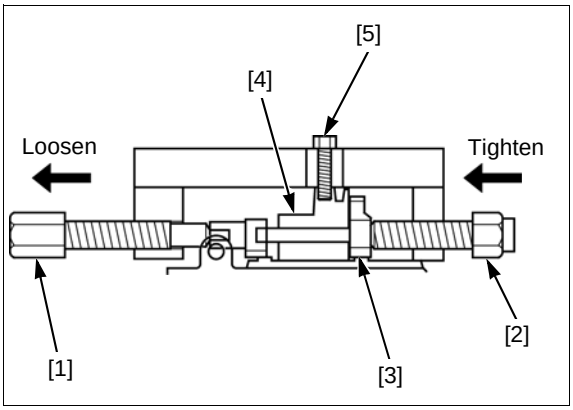
NOTICE

Note that the cylinder head cover mounting boss can be damaged by tightening the push rod with the bolt (5 mm) not in the center but on either side in the long hole. Be sure that the bolt is in the center of the long hole securely.

Using a 14 mm wrench [1], tighten the push rod [2] until the rocker arm [3] comes to the cylinder head cover installation part. [4]



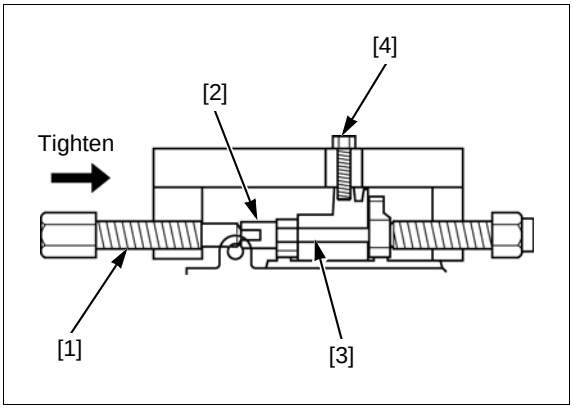
Loosen the push rod [1] and tighten the holder bolt [2] by hand until the valve lifter [3] contacts the cylinder head cover mounting boss [4]. Be sure that the bolt (5 mm) [5] is in the center of the long hole in the special tool.



NOTICE

Note that the cylinder head cover mounting boss can be damaged by tighten the push rod with the bolt (5 mm) not in the center but on either side in the long hole. Be sure that the bolt is in the center of the long hole securely.

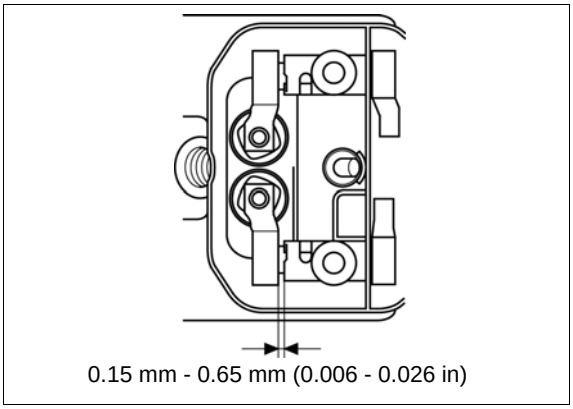
Using a 14 mm wrench, retighten the push rod [1] until the adapter [2] comes to the shaft of the valve lifter [3]. Loosen the push rod and remove the bolt (5 mm) [4], and then remove the special tool.



Measure the clearance between the rocker arm and the cylinder head, and make sure if the clearance are within the specification.

Rocker arm and cylinder head clearance:
0.15 – 0.65 mm (0.006 – 0.026 in)

If the clearance is over the specification, the rocker arm is not correctly installed to the valve lifter. Install the special tool again, and tighten the push rod until the rocker arm is completely pressed onto the shaft of the valve lifter.

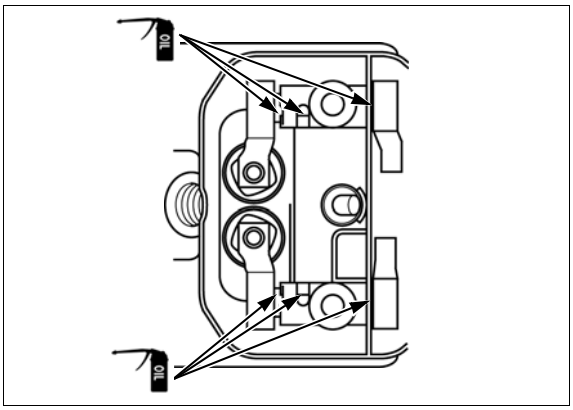


Inject the oil as shown. Lift the lifter by finger and release the lifter, and make sure it operates by the lifter's weight.

Install the adjusting screws and the adjusting screw lock nuts to the rocker arms.

Install the cam pulley (page 13-4).

Adjust the valve clearance (page 3-8).



CYLINDER COMPRESSION CHECK

Warm the engine to normal operating temperature.

Turn the engine stop switch to the OFF position.

Make sure the choke is open.

Drain the fuel from the fuel tank.
Drain the fuel from the carburetor by pushing the carburetor primer pump.

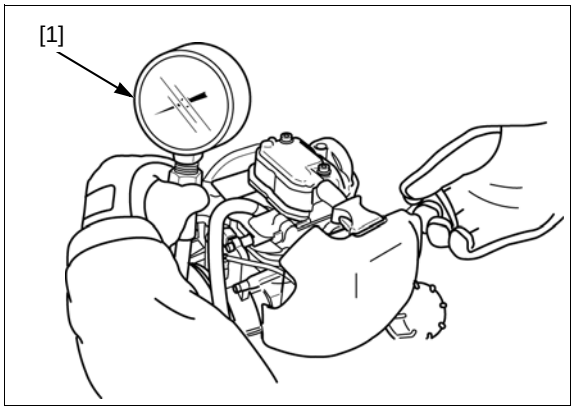
Remove the spark plug cap from the spark plug.
Remove the spark plug using a spark plug wrench.

Pull the recoil starter several times to expel unburned gas.

Attach a commercially available compression gauge [1] to the spark plug hole.

Open the throttle all the way and pull the recoil starter forcefully until the gauge reading stops rising.

CYLINDER COMPRESSION:
0.9 MPa (9.2 kgf/cm^2, 130.9 psi) / 2,000 min^{-1} (rpm)



CYLINDER HEAD/VALVES INSPECTION

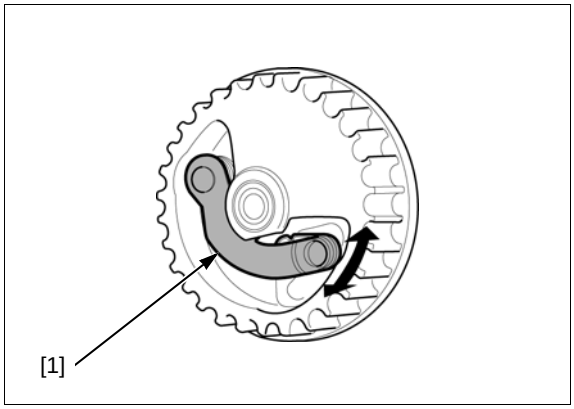
DECOMPRESSOR

Move the decompressor arm with your finger.

Make sure the decompressor weight [1] operates smoothly.

Check that the decompressor moves and automatically returns back to its original position.

If the decompressor is faulty, replace the cam pulley as an assembly.

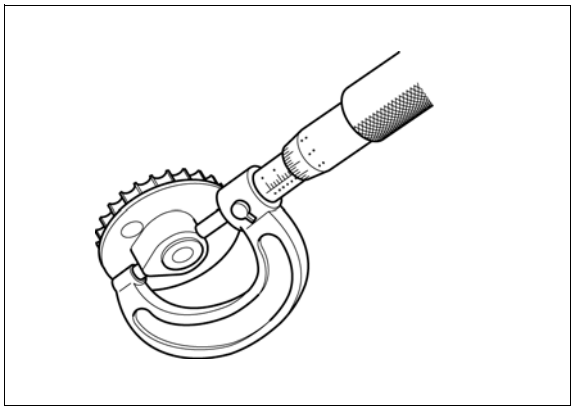


CAM HEIGHT

Measure the cam height.

STANDARD: **21.897 – 22.297 mm (0.8621 – 0.8778 in)**
SERVICE LIMIT: **21.797 mm (0.8581 in)**

If the measurement is less than the service limit, replace the cam pulley.

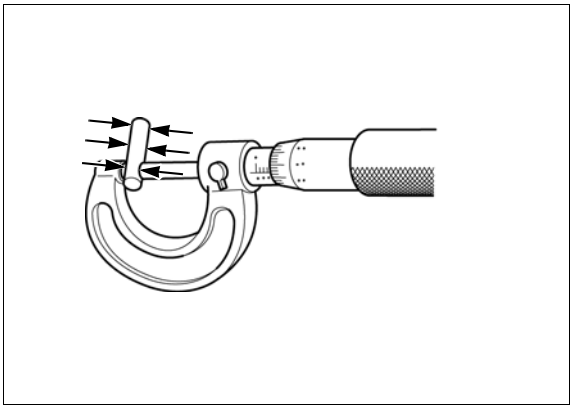


CAM PULLEY SHAFT O.D.

Measure the cam pulley shaft O.D. at three points (both ends and middle). Take the minimum reading to determine cam pulley shaft O.D.

STANDARD: **3.990 – 4.000 mm (0.1571 – 0.1575 in)**
SERVICE LIMIT: **3.950 mm (0.1555 in)**

If the measurement is less than the service limit, replace the cam pulley shaft.

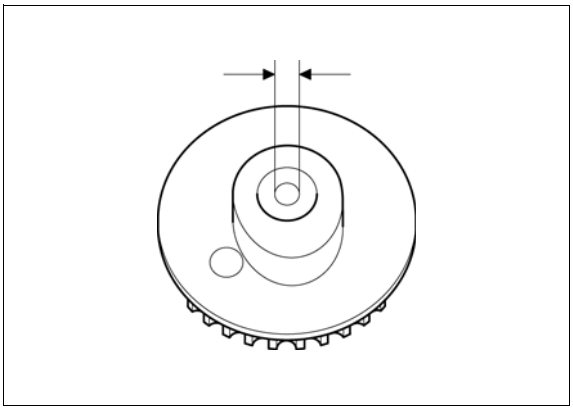


CAM PULLEY I.D.

Measure the cam pulley I.D.

STANDARD: **4.020 – 4.050 mm (0.1583 – 0.1594 in)**
SERVICE LIMIT: **4.100 mm (0.1614 in)**

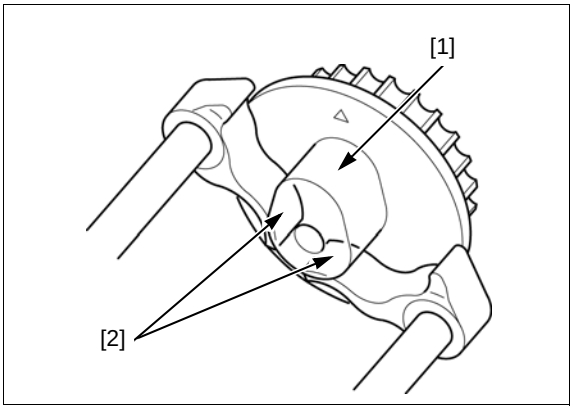
If the measurement is more than the service limit, replace the cam pulley.



CAM PULLEY AND VALVE LIFTER

Check for damage or wear of the cam [1], cam pulley and the cam contact section [2] of the valve lifter.

If the cam is abnormally worn or damaged, replace the cam pulley and valve lifter.

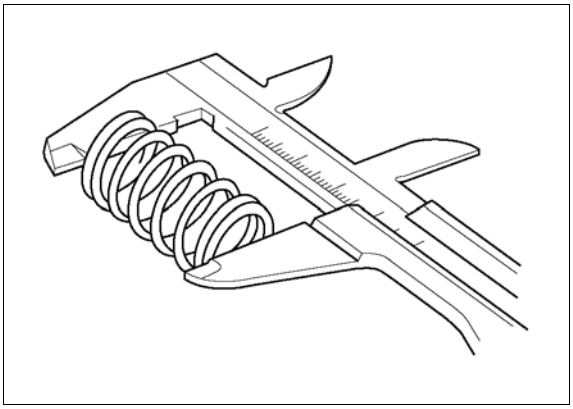


VALVE SPRING FREE LENGTH

Measure the free length of the valve spring.

STANDARD: **20.66 mm (0.813 in)**
SERVICE LIMIT: **20.00 mm (0.7874 in)**

If the measured length is less than the service limit, replace the valve spring.



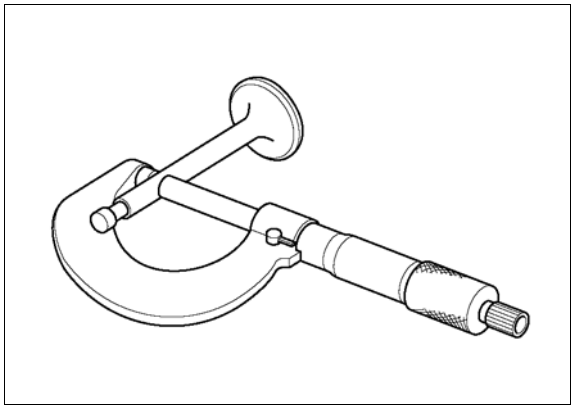
VALVE STEM O.D.

Inspect each valve for bending or abnormal stem wear.

Measure and record each valve stem O.D.

STANDARD:
IN: 3.470 – 3.485 mm (0.1366 – 0.1372 in)
EX: 3.435 – 3.450 mm (0.1352 – 0.1358 in)
SERVICE LIMIT:
IN: 3.400 mm (0.1339 in)
EX: 3.380 mm (0.1331 in)

If the measurement is less than the service limit, replace the valve (page 13-5).

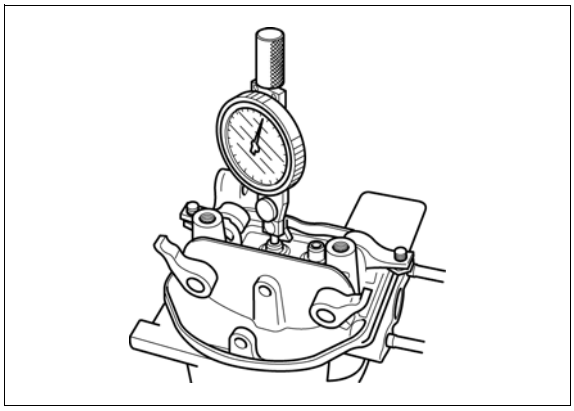


VALVE GUIDE I.D.

Measure and record each valve guide I.D.

STANDARD: **3.500 – 3.518 mm (0.1378 – 0.1385 in)**
SERVICE LIMIT: **3.560 mm (0.1402 in)**

If the measured valve guide I.D. is more than the service limit, replace the crankcase set.



VALVE STEM-TO-GUIDE CLEARANCE

Subtract each valve stem O.D. from the corresponding valve guide I.D. to obtain the stem-to-guide clearance.

STANDARD:
IN: 0.015 – 0.048 mm (0.0006 – 0.0019 in)
EX: 0.050 – 0.083 mm (0.0020 – 0.0033 in)
SERVICE LIMIT:
IN: 0.098 mm (0.0039 in)
EX: 0.120 mm (0.0047 in)

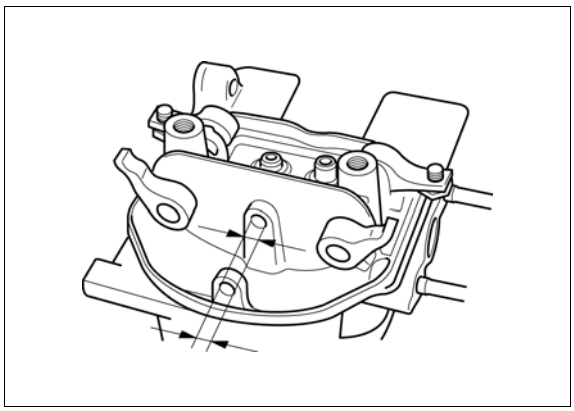
If the calculated clearance is more than the service limit, replace the valves and recheck the clearance.
If the clearance is still more than the service limit with the new valve, replace crankcase set.

CYLINDER BARREL (Cam pulley shaft bearing I.D.)

Measure the cam pulley shaft bearing I.D.

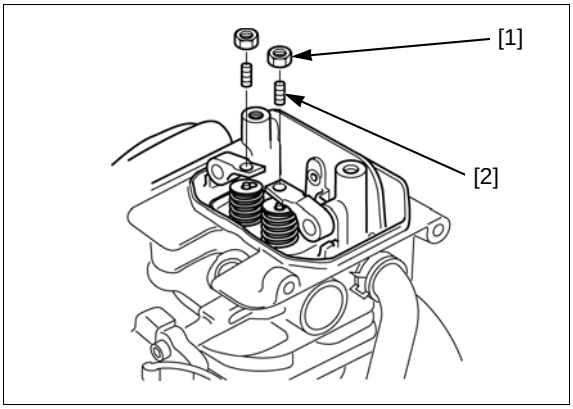
STANDARD: **4.000 – 4.018 mm (0.1575 – 0.1582 in)**
SERVICE LIMIT: **4.050 mm (0.1594 in)**

If the measurement is more than the service limit, replace the crankcase set.



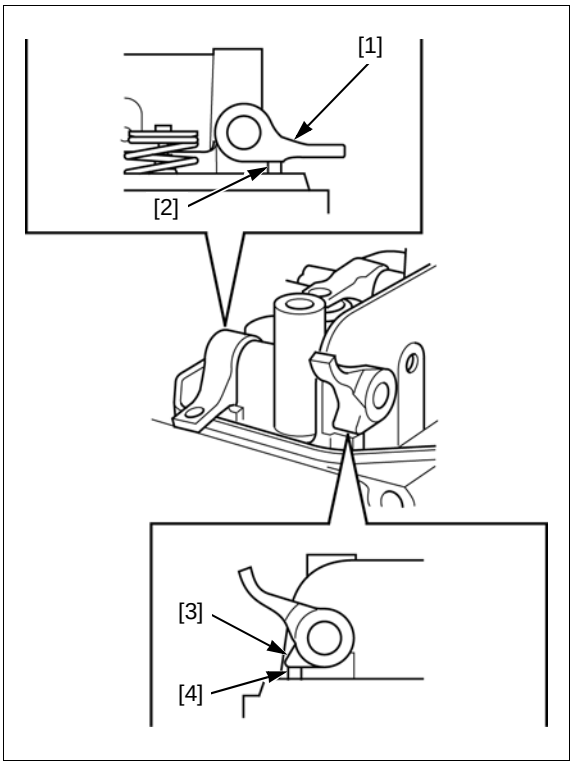
ROCKER ARM AND INSTALLATION RIB CLEARANCE

Remove the adjusting screw lock nuts [1] and remove the adjusting screws [2] from the rocker arms.



Open the rocker arm to the outside and check that there is no clearance between the rocker arm [1] and installation guide rib [2], and the projection of the valve lifter [3] and installation guide rib [4].

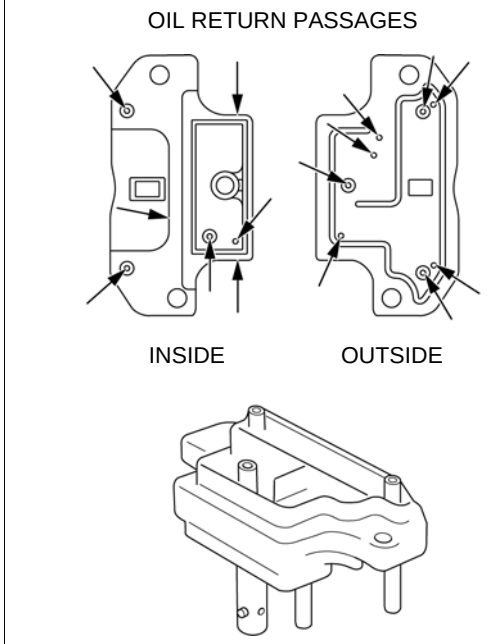
If there is a clearance between the rocker arm and installation guide rib, replace the rocker arm and valve lifter (page 13-5) and check the cam pulley.



CYLINDER HEAD INNER COVER

Check the oil return passage of the cylinder head inner cover for restrictions.

If they are restricted, clean with the compressed air.



MUFFLER REMOVAL/INSTALLATION

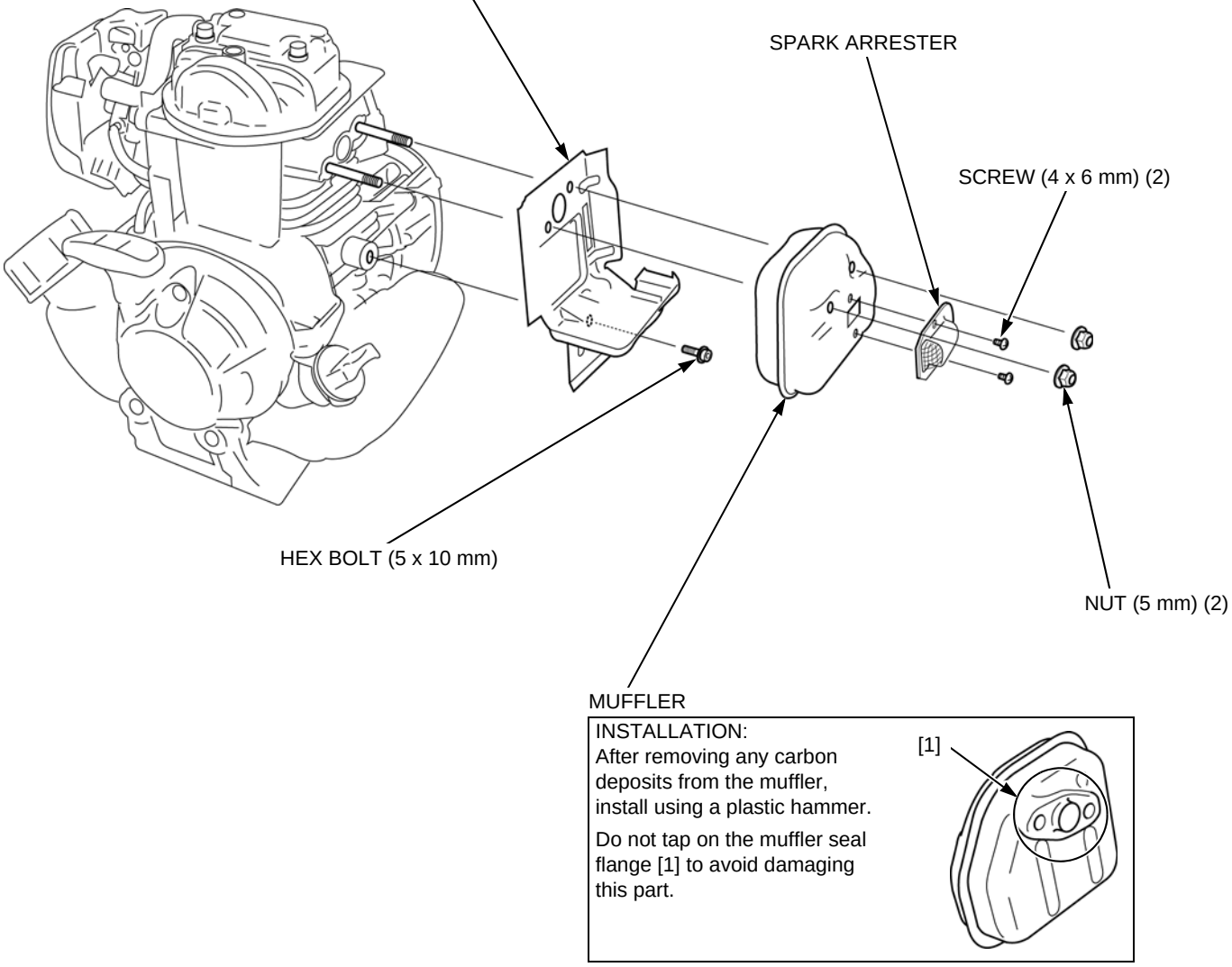
⚠CAUTION

The muffler becomes very hot during operation and remains hot for a while after stopping the engine.

Touching a hot muffler will severely burn you.

Allow the muffler to cool before proceeding.

Remove the top cover (page 5-2).



INSTALLATION:
After removing any carbon deposits from the muffler, install using a plastic hammer.

Do not tap on the muffler seal flange [1] to avoid damaging this part.

EXHAUST PIPE STUD BOLT REPLACEMENT

Remove the muffler (page 14-2).

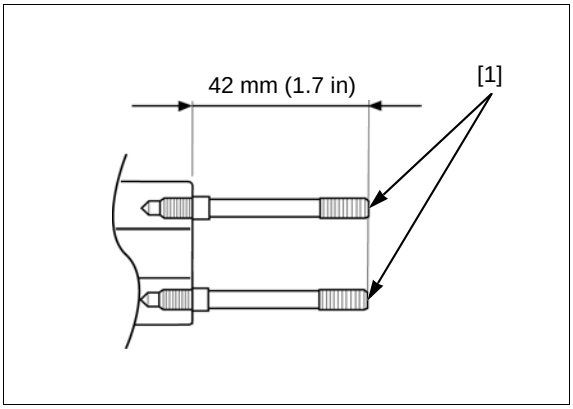
Remove the stud bolts [1] from cylinder barrel.

Install the stud bolts and tighten to the specified torque.

TORQUE: 4.4 N·m (0.45 kgf·m, 3.2 lbf·ft)

Check the specified length.

SPECIFIED LENGTH: 42 mm (1.7 in)



MEMO

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